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# INTERNATIONAL ABSTRACT OF SURGERY

JULY, 1939

## SURGERY AND THE BASIC SCIENCES

### THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

A C IVY, M D and J S GRAY Ph D Chicago, Illinois

#### VITAMIN K AND OBSTRUCTIVE JAUNDICE

A long series of researches in basic medical sciences has in the past year apparently culminated in the solution of one of the most perplexing of clinical problems the explanation and methods for the control of the hemorrhagic diathesis of jaundice. This series of researches began in 1929 when Dam (1) placed chicks on a synthetic diet containing only cod liver oil as a source of the fat soluble vitamins in order to conduct experiments on the cholesterol metabolism. It was noted that the chicks developed a syndrome characterized by severe subcutaneous and intramuscular hemorrhages and erosions of the lining of the gizzard. Although these symptoms suggested a deficiency of Vitamin C, Dam (2) was unable to control them by the administration of lemon juice. McFarlane, Graham and Richardson (3) observed a similar hemorrhagic condition in chicks reared on an ether extracted diet. Blood from these animals was observed to remain uncoagulated when allowed to stand over night. Holst and Halbrook (4) made the same observation, but suspected a Vitamin C deficiency since the condition responded to the inclusion of cabbage in the diet. In 1934 Dam and Schonheyder (5) reported that cereals contained adequate amounts of a curative substance. Their finding that ascorbic acid and cod liver oil failed to influence the hemorrhagic tendency definitely eliminated Vitamins A, D, and C. In addition to gross spontaneous hemorrhages the deficient chicks failed to grow nor

mally and exhibited severe anemia. Since the most characteristic symptom appeared to be a loss of blood coagulability (spelled with a K in the Germanic languages) the new vitamin was given the name of Vitamin K. Subsequent investigation revealed that the gizzard erosions were due to the absence of an entirely different dietary factor.

Schonheyder (6) has shown that the enormous delay in coagulation time in chicks deficient in Vitamin K is not due to a disturbance in the fibrinogen, calcium, or cellular elements of the blood or in the thrombokinase content of the tissues. Some constituent of normal blood plasma was absent however for the addition of normal plasma to the blood of bleeding chicks restored the coagulation time to normal. The deficient element in the coagulation process was shown by Dam, Schonheyder and Tage Hansen (7) to be prothrombin. Although Vitamin K itself could not behave *in vitro* as prothrombin, inconclusive evidence was obtained that Vitamin K might be a constituent of prothrombin perhaps a prosthetic group of the prothrombin complex. By a more convenient and accurate method, which involved the same principles as Quick's method for the determination of prothrombin (*vide infra*), Schonheyder (8) has demonstrated an almost complete disappearance of prothrombin from the blood of chicks deficient in Vitamin K. According to the results of Dam, Glavind, Lewis, and Tage Hansen (9) the intravenous or intramuscu-

lar injection of Vitamin K concentrates in the form of an emulsion reduced the coagulation time within an hour. The vitamin was ineffective when administered subcutaneously unless it was dissolved in water with the aid of desoxycholic acid.

Vitamin K was reported by Dum (10) to be present in high concentration in hog liver and in certain seeds and green leafy vegetables, but to be absent from wheat germ oil. The latter finding clearly differentiated it from Vitamin I. It was found to be a fat soluble vitamin present in the non saponifiable but non sterol fraction of extracts from potent sources. These findings in regard to the chemical behavior of the vitamin were confirmed promptly and independently by Almquist and Stokstad (11) who continued the investigations of Holst and Halbrook mentioned previously. Almquist (12) later prepared a material which underwent crystallization at low temperatures and which when added to the diet of chicks in quantities of from only 2 to 4 mgm per kgm of food protected chicks against deficiency symptoms. More recently Almquist and Klose (13) have prepared a crystalline derivative of Vitamin K by conjugation with cholic acid. The free vitamin is apparently an oily liquid at room temperatures. It has not yet been synthesized nor has its chemical structure been elucidated.

The hemorrhagic tendency as a result of Vitamin K deficiency was originally observed in chicks. Subsequently Dam, Schonheider and Lewis (14) produced the same symptoms in a variety of avian forms but were unsuccessful in the case of rats, guinea pigs and dogs. Almquist and Stokstad (15), (16) and Almquist, Pentler and Vecchi (17) have shown that micro-organisms are capable of synthesizing the vitamin in food in feces or in pure culture. This may possibly account for the difficulty encountered in producing deficiency symptoms in mammalian forms. However, Murphy (18) has recently published a preliminary report which suggests that a hemorrhagic condition associated with delayed coagulation may be produced in mice by dietary means. Greaves (19) has recently reported that 1 of 77 rats maintained on a diet deficient in Vitamin K developed hemorrhagic symptoms associated with a low prothrombin level of the blood. The condition was corrected by the administration of Vitamin K concentrates. Even when reared on a diet deficient in Vitamin K, rats were found to eliminate the vitamin in the feces as a result of bacterial synthesis. Apparently, therefore, dietary means alone may suffice to produce the condition in occasional animals.

The real significance of Vitamin K for mammalian physiology and for clinical medicine was revealed by investigations along a different line. An enormous literature relative to the coagulation defect in the hemorrhagic diathesis of jaundice had accumulated. This work merely served to prove quite conclusively that bleeding in jaundice is in no way related to a disturbance in fibrinogen or calcium levels of the blood to a deficiency in the formed elements of the blood nor to any other easily studied component of the clotting mechanism. Until a few years ago the only available method for the determination of the prothrombin level of the blood was Howell's prothrombin time. Since this method consisted of determining the clotting time of recalcified plasma it obviously was not specific for prothrombin. In view of this situation Quick, Stanley Brown and Bancroft (20) in 1935 devised a more specific method for the determination of blood prothrombin, the only well known element of the clotting mechanism which had not been adequately studied. In this method the most important variable the thrombokinase or platelet or tissue factor is controlled by adding an excess of this substance to plasma before determining the coagulation time. By this method these authors were able to reveal a prothrombin deficiency in the blood of jaundiced patients exhibiting a hemorrhagic tendency. Warner Brinkhous and Smith (21) devised a still more accurate and specific method for the determination of the concentration of prothrombin in the blood. This method was applied by Hawkins and Brinkhous (22) to the study of the bleeding tendency, which was previously observed to occur in dogs with chronic biliary fistulas. In such animals they observed a marked deficiency in the prothrombin level of the blood, which together with the bleeding could be prevented by returning bile to the intestinal tract.

In the meantime Greaves and Schmidt had been conducting a series of experiments revealing the necessity of bile for the adequate absorption of the fat soluble vitamins A, D and K. These investigators (23) observed a hemorrhagic tendency in their rats with bile fistulas and demonstrated that it was accompanied by a decrease in the blood prothrombin level as determined by the method of Quick. The condition could be prevented by the oral administration of bile. By this time the existence of Vitamin K was becoming generally recognized and Greaves and Schmidt restored the normal level of prothrombin in the rats with bile fistulas by the administration of concentrates of the vitamin. Accordingly the

evidence began to indicate that fat soluble Vitamin K is required by mammals and that if bile, which is essential for its absorption, is absent from the intestine deficiency symptoms quickly supervene.

Greaves (24) has recently confirmed and extended his findings in rats with bile fistulas and showed that bile is necessary for the absorption of Vitamin K, and that the bleeding tendency may be cured by the administration of bile if the diet contains Vitamin K, or by large doses of Vitamin K alone. Other vitamins were entirely ineffective. Smith, Warner, Brinkhous, and Seegers (25) have reported analogous results in dogs with bile fistulas, and Dam and Glavind (26) in chicks with bile fistulas.

Another factor has been shown to be of importance in the role of Vitamin K in the economy of the mammalian organism. Smith, Warner, and Brinkhous (27) have shown that mild liver damage, produced by the repeated administration of chloroform to dogs, lowers the blood prothrombin level and induces bleeding. Under these circumstances the blood fibrinogen is not reduced. Warner (28) has produced the same effects in rats by partial removal of the liver. Hepatic insufficiency of a degree sufficient to dangerously lower the blood prothrombin level leaves the fibrinogen concentration unaffected. The evidence therefore indicates that an adequately functioning liver is essential for the utilization of Vitamin K in the production of prothrombin.

The possible clinical applications of these results obtained by animal experimentation were quickly realized and appropriate investigations were undertaken by a number of workers. Quick (29) has demonstrated low blood prothrombin levels in certain patients with jaundice or liver damage. Brinkhous, Smith, and Warner (30) have shown that the bleeding tendency in jaundice is accompanied by marked reduction in the blood prothrombin concentration. They found that the administration of bile or of Vitamin K concentrates restored normal blood values and corrected the tendency toward bleeding. Dam and Glavind (31) have also reported the successful treatment of bleeding in jaundice by the administration of Vitamin K concentrates. Snell, Butt, and Osterberg (32) have confirmed these results and claim that active bleeding may be controlled by this therapy. The evidence appears to indicate that a determination of the blood prothrombin level is a valuable indication of future bleeding in jaundiced patients and that Vitamin K and bile salts afford an effective therapeutic measure in the control of the condition.

In 1934 before Vitamin K had come into prominence, McNealy, Shapiro, and Melnick (33) reported that the administration of viosterol was effective in controlling the hemorrhagic diathesis of jaundice. The viosterol was given orally in conjunction with bile salts in those patients whose acholic stools betrayed the absence of bile from the intestine. This addition of bile salts may have augmented the absorption of Vitamin K as well as that of Vitamin D and thereby contributed to the effectiveness of the therapy. However, effective results were obtained in patients to whom bile salts were not administered. These results could not be attributed to an improved absorption of Vitamin K. Gray and Ivy (34) who studied the blood calcium changes in these patients concluded that the most reasonable hypothesis which might be advanced to explain the effectiveness of viosterol was that it improved liver function. How this improved liver function was translated into a reduction of the bleeding tendency was completely unknown. However, if the beneficial effect of the viosterol were sufficient to enable the liver to utilize more efficiently the limited amounts of available Vitamin K, so as to elevate the prothrombin concentration from a hemorrhagic level to a slightly higher level, the results could be explained. This is, of course, pure speculation and the future will have to reveal whether or not it is valid.

Recent investigations have suggested another clinical application of Vitamin K. Brinkhous, Smith and Warner (35) have reported that the blood prothrombin level of infants is very low when compared with adult values. After the first several months of life, however, it approaches the adult level. In a case of hemorrhagic disease of the newborn the prothrombin concentration was found to be only 5 per cent of the adult level. A transfusion of adult blood significantly raised this value and resulted in the cessation of bleeding. Waddell, Guerry, Bray, and Kelley (36) have recently reported that the administration of Vitamin K concentrates to two infants with very low prothrombin levels and prolonged coagulation time dramatically restored normal values. Vitamin K, therefore, may provide a simple and effective means for the control of hemorrhagic disease of the newborn.

A new factor which may have to be considered in the explanation of hemorrhagic tendencies has been pointed out by Warner, Brinkhous, and Smith (37). These investigators have found that the prothrombin level is quite constant in various mammalian species, but that man and the guinea pig differ from the others in that the prothrombin



is converted to the active thrombin at a much slower rate. This may account partially for the fact that the human species is so subject to the hemorrhagic diathesis.

Lichtman and Chambers (38) have isolated a sterol compound from liver which is chemically distinguishable from Vitamin K but which is nevertheless claimed to be capable of restoring a normal coagulation time in chicks deficient in Vitamin K and in rats with bile fistulas.

## VITAMIN P AND CAPILLARY FRAGILITY

It is widely accepted that an increase in the fragility of the capillaries is one of the earliest symptoms of Vitamin C deficiency. However, an increased capillary fragility is not specific for this condition for a large number of factors influence the resistance of the capillaries as determined by the positive pressure or negative pressure methods. Liebmann, Wortis and Wortis (40) have been unable to demonstrate any accurate correlation between capillary fragility as determined by these methods and the level of ascorbic acid in the various body fluids. Nevertheless, claims have been frequently made that a variety of hemorrhagic tendencies accompanied by increased capillary fragility will respond to the administration of natural sources of Vitamin C. Armentano (41) was unable to confirm these reports when pure ascorbic acid was used. This suggested to Armentano, Bentsath, Beres, Rusznayak and Szent Gyorgyi (42) in 1936 that some active constituent in the natural sources of the vitamin which is lost in the process of purification might be responsible for controlling these purpuric tendencies. They found that crude preparations of Vitamin C were effective in the treatment of certain types of purpura which failed entirely to respond to ascorbic acid. The active constituent of these extracts was isolated in crystalline form as a mixture of flavone glucosides. To this substance they gave the name citrin or Vitamin P. The test subjects were observed visually for purpura; capillary resistance was measured by a suction method; capillary permeability was determined by the method of Landis. The administration of 40 mgm of extract per day to patients who were abnormal with respect to these tests restored normal conditions. Thrombocytopenic purpura, however, was not improved by these measures. Bruckner and Szent Gyorgyi (43) later identified the active flavones as hesperidine and eriodictyol glucoside.

Following these clinical observations attempts were made to provide experimental evidence from animals in support of the concept of the new vita-

A new preparation remarkably effective as a hemostatic agent for the control of bleeding during surgical procedures has been obtained by Seegers, Warner, Brinkhous and Smith (39). These workers have made highly potent sterile solutions of thrombin which when sprayed on bleeding tissues almost instantly put an end to the bleeding. These solutions are effective in the control of bone bleeding without the use of wax.

min. Bentsath, Rusznayak and Szent Gyorgyi (44) reported that guinea pigs maintained on a scorbutic diet lived somewhat longer, lost less weight and exhibited less severe hemorrhages when citrin was made available to the animals. Both the control and citrin treated animals, however, succumbed to scurvy. The same authors obtained similar results when the citrin was replaced by hesperidine (45). These results were quickly challenged, however, by Zilva (46) who could detect no effect from the administration of citrin or its component flavones. The meliorative effects reported by Szent Gyorgyi could be readily produced by the administration of subcurative doses of ascorbic acid. Neither Moll (47) nor Matuensis (48) were able to influence the course of scurvy in guinea pigs by means of citrin. Bentsath and Szent Gyorgyi (49) then revealed that their experiments had been repeated at their request in a number of independent laboratories with some successes and some failures. These discrepancies they attributed to the fact that citrin must contain traces of ascorbic acid to be effective. In fact, Bentsath and Das (50) claimed that the effect of citrin could be demonstrated only in animals which had received supplements of Vitamin C before being subjected to the scorbutic diet. Zilva (51) immediately pointed out that this factor could not have influenced his failure to confirm the effects of citrin. Accordingly, the animal experiments have failed to provide any evidence supporting the existence of the proposed vitamin. A method for studying this substance in animal experiments would be of great importance but as Robeznieks (52) has shown, the available methods for the detection of flavones are so insensitive as to preclude the possibility of constructing a flavone free diet for animals.

Chemical investigation of the effects of citrin in hemorrhagic conditions has proceeded. Elmhj and Warburg (53) have reported that occasional individuals with a hemorrhagic tendency associated with low ascorbic acid levels in the blood fail

to respond to the administration of excessive amounts of ascorbic acid. Three such subjects studied, however, did respond to the ingestion of lemon juice with a rise of the ascorbic acid content in the blood and disappearance of the bleeding tendency. Lajos (54) has found citrin to be effective in decreasing capillary fragility and permeability in "vascular" purpuras and hemorrhagic nephritides. Similar results have been claimed by Raunvert (55) and Lotze (56). Scarborough and Stewart (57) administered hesperidine to 6 patients with resulting improvement of the clinical condition and reduction of the capillary fragility. Three of these patients were exhibiting spontaneous petechial hemorrhages which had followed the administration of arsenic or bismuth.

Jersild (58) reported a case of a young woman with a typical case of Schonheim-Henoch purpura of many years' standing which failed completely to respond to intravenous ascorbic acid therapy.

Treatment with citrin, however, dramatically alleviated the symptoms and markedly improved capillary resistance. Withdrawal of the citrin produced relapses. The patient was later placed on a diet so deficient in Vitamin C that ascorbic acid all but disappeared from the blood, yet no return of symptoms occurred as long as citrin was regularly administered.

The present status of Vitamin P is by no means clear. Animal experiments have yielded no support for the existence of the vitamin. Clinical experience with the substance is not yet extensive enough to definitely establish its therapeutic or pharmacological activity. At the present time even elementary evidence to prove that citrin is a vitamin required by man or any other species is completely lacking. However, if the clinical trials continue to be sufficiently encouraging to stimulate interest in its investigation, experimental procedures will undoubtedly be devised to disclose its true nature.

## LIPOCAIC

In a previous review of this series (59) the subject of choline and its relation to fat deposition in the liver was discussed. It was mentioned that Dragstedt, Van Prohaska and Harms (60) had presented evidence to indicate that raw pancreas contained a factor in addition to choline which was capable of preventing or curing the fatty degeneration of the liver which is found typically in the depancreatized dog. Little more was said in regard to the theory which had been formulated on the basis of this finding because at that time a lively controversy was in progress concerning it. Recently Dragstedt (61) has reviewed his evidence supporting the theory that this new factor obtainable from pancreas called lipocaine constitutes an internal secretion of this organ. It is well known that depancreatized dogs which do not receive raw pancreas in the diet develop a fatty liver. Dragstedt claims that this does not occur in dogs with ligated pancreatic ducts or with pancreatic fistulas and that the administration of pancreatic juice does not prevent the development of the liver changes in depancreatized dogs. For these reasons he claims that the external secretory function of the pancreas is not concerned with the development of the fatty liver; this condition results from the loss of an internal secretion of the pancreas separate from insulin which results from the complete removal of the organ. This internal secretion he has extracted from the pancreas in the form of a highly potent extract lipocaine. His evidence that lipocaine does not consist of choline

was that whole pancreas or extracts are much more effective than could be accounted for on the basis of their content of choline. However, Berg and Zucker (62) have reported that a fatty liver develops in dogs following ligation of the pancreatic ducts or construction of a pancreatic fistula. Rall, Rubin and Present (63) have more recently reported similar results. If these findings are valid they present a serious obstacle to the hormone theory of the etiology of the fatty liver. They would suggest that the external secretions of the pancreas are involved. Criticism from another angle soon appeared. Although MacKay (64) reported that the effect of pancreas extracts in preventing the development of fatty livers in rats maintained on a high fat diet was greater than could be accounted for on the basis of the choline present, MacKay and Barnes (65) subsequently denied this. Aylward and Holt (66) and Best and Ridout (67) also concluded that the only active constituent of raw pancreas or pancreas extracts was choline, as determined in rats. However, more recently Channon, Loach and Tristram (68) have conducted a very careful and extensive series of experiments in rats in which they point out the errors of the previous investigators and conclude from their own work that pancreas extracts do contain a factor in addition to choline, which is effective in preventing the development of dietary fatty livers in rats. Dragstedt, Donovan, Goodpasture, and Geer (69) answered some of these criticisms by preparing extracts of lipocaine which

were effective in amounts which contained only traces of free choline. Clark, Vermeulen, Donovan and Dragstedt reported this spring at the meetings of the American Physiological Society that they had been able to prepare extracts which were effective in daily doses of less than 100 mgm. which are much less than the necessary dose of pure choline. Although the evidence supporting the view that lipocac is an internal secretion of the pancreas is by no means complete, the evidence showing that lipocac is not choline and that it is effective in preventing the deposition of fat in the liver of depancreatized dogs is fairly convincing.

The fact that lipocac is effective in preventing the abnormal deposition of fat in the liver has suggested its possible usefulness in preventing the deposition of lipid material in atheromas of the aorta in rabbits maintained on a high cholesterol diet. That lipocac is effective in preventing this pathological change has been reported by Huber Brown and Casey (70). Choline has been reported by Baumann and Rusch (71) to be ineffective and by Steiner (72) to be only slightly effective in preventing this aortic degeneration.

Some rather suggestive experiments have been recently reported by Swanson and Nelson (73). These investigators have found that rats maintained on a presumably adequate diet containing dried canned pork as a source of protein suddenly develop toxemia with convulsions during pregnancy. The livers of these animals were found to be friable and fatty. It was found that fresh liver protected the animals against the condition but that choline or lecithin proved to be of no benefit. Lipocac in quantities of only 4 mgm. per day was discovered to be fully protective.

Very little clinical work has as yet been done with choline or lipocac in spite of the fact that the therapeutic possibilities are quite inviting. Grayzel and Radwin (74) reported the successful reduction of the size of the liver by the administration of lipocac in 3 cases of juvenile diabetes with hepatomegaly. Snell and Comfort (75) have reported that choline produced a reduction in the size of the liver and an improvement as shown by dye retention tests in a case of fatty liver associated with extensive destruction of the pancreas. Stoesser (76) has noted a decrease in the blood lipids in children at the height of acute infections and during convalescence. The administration of raw or desiccated pancreas to such children resulted in an elevation of the blood lipid levels much as occurs under the same circumstances in depancreatized dogs. The most completely studied case yet reported is that of Rosenberg (77).

At operation a liver biopsy specimen taken from a female patient revealed severe fatty metamorphosis which from clinical evidence had been present for a period of months. The daily administration of lipocac to this patient produced marked clinical improvement. The necessity of performing an operation for the removal of gall stones permitted the securing of a second biopsy specimen which revealed a complete return to normal.

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per cent solution of the dye was prepared and sterilized and from 20 to 30 c cm warmed to body temperature were injected intravenously. After the first 3 or 4 c cm the patient assumed a faint greenish color which deepened as the injection proceeded and continued up to one half hour and began to fade in 3 or 4 hours. The dye was excreted mainly through the kidney, the urine remaining colored for two or three days.

Choroid or retinal exudates stain deeply. The retina in optic atrophy does not stain with the dose used to date. In some cases of retinal detachment additional tears were visualized because of the staining around them.

The author makes few claims except for a demonstration of the feasibility of vital staining of the retina. WILLIAM A. MANN, M.D.

### MOUTH

Brown, J. B. The Management of Compound Injuries of the Face and Jaws. *South M J* 1939 32:146

The term compound injuries of the face may be used to designate any serious facial injury to soft tissue or bone. Automobile injuries are often of this type and are often as bizarre as those of firearm injuries. There may be cranial and cervical spine injury complicating the facial injury and neurological and roentgenological examination should be made.

Shatterproof glass offers an instance that may produce markedly comminuted fractures with little laceration of the surface but often with wide preauricular avulsion of the scalp. If the glass does break, the most clean cut wound of soft parts, bone and cartilage may occur and when once broken the glass may leave many chips that may get into the wound.

In extensive injuries it may be best to wait until the patient is in the operating room before manipulation of the tissue implies to find the extent of the injury. There should be a recording of the loss or tearing of all the features, the extent of detachment from the bone and then in regard to the preservation of function and occlusion of the airway, loss of vision or facial palsy should be noted.

Dirt and foreign bodies in clothing must be removed and it may be helpful to know the type of dirt or street into which the patient has been thrown. Antitetanus and gas gangrene serum are given when indicated.

Roentgenograms should be taken in all fractures and particularly in those cases of questionable fracture.

It is best to care for these wound and fractures in the first twelve to twenty hours if possible before swelling, organization of the clots, and infection have occurred. If seen later then manipulation of the fractures can be delayed but the soft parts may still be approximated. Delay in treatment is necessary if there is neurological damage that requires care or complete rest or if shock is present. If the patient is

intoxicated no jaw to jaw fixation should be done until he is recovering and is not apt to vomit.

Anesthesia can be basal or local or nerve block. General anesthesia is to be avoided but is often necessary in children.

Cleaning of the wound is the most important consideration and may include saline irrigations, soap and water cleaning (either as a solvent if necessary), the removal of hair, bits of clothing, all possible foreign bodies and detached chips of bone and usually the application of an antiseptic if one is preferred. The decision of when to clean and when to give the anesthesia is difficult but a simple rule is to clean as far as possible with the patient enduring the pain and then to give local or general anesthesia when it is necessary.

Meticulous cleaning should almost entirely constitute the debridement of a face and if necessary, it should be practiced carefully so that parts of features will not be sacrificed.

The next step is the replacement and fixation of bone and a few methods are cited. External dependent drainage should be considered in all patients. If the nasal airway is occluded it can be re-established by means of a good sized rubber tube being slipped through. Other bone replacement should then be done as elevation of the orbits and the nose. The same conservation of bone should be practiced as for soft parts.

For suturing of the soft parts new cleaning can be done and fresh instruments used if the mouth secretions can now be avoided. In complicated tears a design for closure may be difficult but a start should be made from a known point as a lip or nostril border. Deep fine silk sutures may be placed so that the wound edges are closed before any other skin sutures are inserted. Uneven edges if visible are carefully replaced to avoid any unnecessary loss of tissue.

Large or small trap door flaps often give bad final scars because of the tendency of the circular base to contract and the wounds should be closed carefully with especial provision to prevent blood clots under them.

Small drains are used at suitable dependent areas if the necessity is at all apparent. Careful dressings with marine sponges or mechanical waste for pressure to control hemorrhage and swelling and thereby infection are extremely important. The patient is usually most comfortable with a large firmly supporting bandage. HARRY S. ALLEN, M.D.

### PHARYNX

White, F. W. and Hubert, L. Parapharyngeal Hemorrhage: Diagnosis and Treatment. *Arch Otolaryng* 1939 29:1

Although many specialists in diseases of the ear nose and throat have been fortunate enough not to have had any harrowing experiences with fatal or nearly fatal hemorrhage or fatality following septic thrombosis of the internal jugular vein, this good

fortune is no guarantee for the future. To Mosher in this country is due much of the present interest in the parapharyngeal (pharyngomaxillary) space and its inflammatory diseases.

The authors analyze 26 cases of pharyngomaxillary infection from which they arrive at several thoughtful conclusions. They believe that the degree of infectivity of the causative organisms for a given person determines the seriousness of the pharyngomaxillary invasion. In many instances conservative treatment of pharyngomaxillary infection is successful. Every effort should be made to determine the status of the nerves in the pharyngomaxillary space since such knowledge may aid in making a diagnosis. When the condition is doubtful the nerves may confirm the suspicion that pharyngomaxillary infection exists.

Free, active hemorrhage from the throat with or without apparent inflammation requires not local treatment but bold external operative measures. While fatal hemorrhage occurs comparatively infrequently still it occurs too frequently. Many patients die from unannounced sudden overwhelming but avoidable hemorrhages. Meddlesome incision of a lateral pharyngeal swelling may lead to hemorrhage. If the condition is treated conservatively ligation may not be necessary. Aural hemorrhage associated with pharyngomaxillary infection requires immediate ligation of the common carotid artery.

If any doubt exists regarding erosion of the internal carotid artery the external carotid and the ascending pharyngeal arteries should be ligated and a loose ligature placed around the common carotid artery. Ligation of the common carotid artery when it is done slowly (in minutes, not seconds) and with an attempt actually to prevent the flow of blood beyond the ligature not just to feel the severance of the intima is a life saving operation as compared to temporizing methods of operation by the intra-pharyngeal route.

Hemorrhages from the throat and the ear associated with trismus involvement of the nerves lateral pharyngeal tumefaction sepsis and swelling and tenderness of the corresponding side of the neck indicate infection of the pharyngomaxillary fossa.

NOAH D. FABRICANT, M.D.

## NECK

Thompson W. O. The Hypothyroid States. *Med Clin North Am* 1939 23 175

Primary hypothyroidism is caused largely by destruction of thyroid tissue and the symptoms are relieved by the use of desiccated thyroid. Secondary hypothyroidism is due to inadequate stimulation of the thyroid gland especially by the anterior lobe of the pituitary gland and possibly also by the adrenal cortex. Desiccated thyroid relieves only a part of the syndrome. In starvation and nephrosis the basal metabolism may be markedly lowered in a manner not clearly understood. Slight lowering of the basal metabolism occurs rarely in normal individuals after

the administration of iodine. After a subtotal thyroidectomy for hyperthyroidism when the metabolism is normal or only slightly elevated, iodine may occasionally cause a marked lowering and signs of myxedema. Certain other patients with low basal metabolism do not fit definitely into any clinical group and are not improved by treatment with thyroid substance.

Basal metabolism may be regulated by mechanisms other than the thyroid hormone as for example epinephrine, dinitrophenol, dinitro orthocresol and diiodothyronine. Each produces its effect at a different rate and presumably therefore by a different mechanism.

Determination of the level of metabolism is always important but a single test may not be reliable. Basal rates consistently below -15 per cent are usually but not always associated with some pathological disturbance.

The first and most important step in the management of a patient with a low basal metabolism is a decision as to the presence or absence of hyperthyroidism. This may be considered to exist if desiccated thyroid or thyroxine in a suitable dose improves the clinical condition. The ideal method of treatment is to raise the metabolism gradually to normal with slowly increasing doses of desiccated thyroid until the minimum amount is being given that will maintain the basal metabolism at a normal level. In the treatment of hypothyroidism associated with Froehle's syndrome and some cases of Simmonds' disease a combination of desiccated thyroid and the principle from the urine of pregnant women similar to that of the anterior pituitary lobe and suitable dietary measures may produce marked improvement. In patients with Addison's disease receiving maintenance doses of adrenal cortex extract associated hypothyroidism is relieved by the use of desiccated thyroid.

WALTER H. NADLER, M.D.

Negus V. E. The Differential Diagnosis of Intrinsic Carcinoma of the Larynx. *Arch Otolaryngol* 1939 29 223

Negus reviews the diseases which commonly cause confusion in a differential diagnosis of intrinsic carcinoma of the larynx. Not only is there danger that treatment by operation or otherwise may be instituted under a mistaken diagnosis of malignant disease, but there is even greater danger that malignant change may be overlooked until the disease has progressed beyond the chance of cure. He therefore discusses chronic simple laryngitis, hypertrophic laryngitis, hyperkeratosis and pachyderma, syphilitic infiltration and leucoplakia, tuberculous laryngitis and simple neoplasm.

In long standing or progressive hoarseness the signs may be those of chronic inflammation. The whole larynx may be inflamed and the aryepiglottic folds if involved may appear thickened and infiltrated. The vocal cords lose their luster and the margins appear rounded and thickened. In such

cases nasal obstructions or chronic inflammatory changes in the nose sinuses mouth or pharynx are treated. Smoking should be abandoned the use of alcohol kept within limits and the use of the voice reduced or avoided altogether.

Hypertrophic laryngitis may occur as diffuse infiltration of the vocal cords and ventricular bands. There may be a localized tuberosity over the vocal process or a heaping up in the interarytenoid region or finally an isolated plaque of keratosis may be present particularly on the anterior third of one vocal cord. Localized or diffuse overproduction of the superficial epithelium causes considerable difficulty in deciding whether malignant changes are commencing in the deeper layers of what is a potentially precancerous condition. A progressive change in appearance or an increase of symptoms gives warning that a simple process possibly present for years is changing its character. Biopsy may be required to settle the question as to whether drastic treatment is required.

Syphilitic disease of the larynx is such a rarity that its exclusion is probable in practically all cases. Occasionally a patient with hyperkeratosis of long standing presumably associated with syphilis may be seen. An aid to diagnosis is the observation that syphilitic loci are multiple and thus differ from malignant neoplasms which are single. Also syphilis usually is found to affect the pharynx as well as the larynx.

Tuberculous laryngitis may be itself as diffuse and irregular thickening of the whole of one cord even with fixation but usually there is suspicious ulceration over the vocal process or in its neighborhood. There may be associated pseudo edematous swelling of the aryepiglottic fold. Neither the history nor physical examination may give any suggestion that the lungs are involved but roentgen examination should show deposits if any are present. In cases of doubt biopsy will be required. Occasionally a suspicion of tuberculo is may arise in a case in which the correct diagnosis is carcinoma. Here again biopsy may be required.

It is sometimes possible for a simple neoplasm to produce signs and symptoms suggestive of malignant disease. Chondroma of the cricoid cartilage and especially papilloma in an adult may simulate malignant disease. During the healing process after treatment of carcinoma of the larynx by operation or irradiation simple granuloma may appear either at the anterior end of the excavation left by operation or near the anterior commissure after interstitial irradiation.

Negus warns against the misleading results of biopsy. He cites the danger that wrong conclusions may be drawn when in removing a portion of tissue for microscopic examination the surgeon has not gone deep enough to embrace the cancerous area. Biopsy should afford a guide as to whether laryngofissure total laryngectomy interstitial irradiation or telerradiation is indicated.

NOAH D. FABRICANT, M.D.

Crowe S. J. and Broyles E. N. Carcinoma of the Larynx and Total Laryngectomy. *Ann. Otol. Rhinol. & Laryngol.* 1938 47: 875.

Of the two methods of treating carcinoma of the larynx irradiation with roentgen rays or radium and surgical removal the first procedure is very valuable in the treatment of malignant growth but should be used only in inoperable cases or to supplement operative removal. At the present time the results of ray therapy are so erratic and uncertain that whenever the diagnosis of cancer has been established and the growth is found to be still localized and safely removable the operation should not be postponed. There are however many patients with inoperable conditions. The authors believe that until the results of X-ray or radium treatment are more consistent and encouraging in the latter cases an operable new growth in the larynx should never be treated with irradiation alone.

In the second method surgical removal the general principles of the operation are the removal of the growth with an adequate margin to insure against recurrence and to preserve the voice and the normal channels for breathing and swallowing as much as possible. In carefully selected cases laryngofissure is the operation of choice. By laryngofissure the authors mean the removal in one piece of the affected vocal cord including its attachment to the arytenoid cartilage the entire anterior commissure area and a large portion of the thyroid cartilage. Removal by the laryngofissure route is contraindicated if the growth involves the anterior commissure has fixed the true cord or has spread

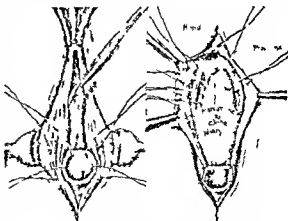


Fig. 1. The most important feature of the operation is shown on the right. Interrupted chromic catgut sutures (size 00) include the mucous membrane flap, the mucous membrane of the pharynx and a little of the under surface of the sternohyoid muscle. When tied the muscle covers the line of incision and prevents leakage of saliva or food into the neck wound. To get this result however the wound must be closed without tension of any of the sutures.

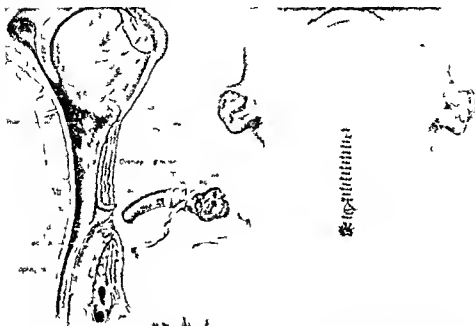


Fig 2 The wound is closed but the skin incision must be opened at the first sign of infection. If there is no infection the rubber tissue drain is gradually withdrawn and removed entirely on the third day. If the tracheal opening ever becomes too small the skin around the lower half is elevated and the underlying anterior wall of the trachea removed with a high frequency cutting current.

to the ventricle or false cord. In all borderline cases in which there is any doubt about the extent of the growth the entire larynx should be removed.

As a result of their experience Crone and Broyles have evolved a one stage operation for total laryngectomy which is simple and free from shock and other postoperative complications. They adhere to the following rules:

- 1 The growth must be operable or intrinsic. The operation is not suitable when the cartilages are invaded, the false cord is involved or the growth has spread to the muscles and glands of the neck.
- 2 The general physical condition must be such that the patient is a reasonably good operative risk.
- 3 Infection in the sinuses, tonsils, teeth, and gums must be eliminated before the operation.
- 4 The anesthesia should be a combination of avertin, procaine, and chloroform.
- 5 In the operative procedure every effort should be made to avoid traumatization with clamps,

retractors, or sutures. Bleeding is controlled with ligatures instead of the high frequency cauterizer. A closure is made that prevents leakage of mouth secretions into the wound or trachea. Pockets or dead spaces are avoided. The only drain left in the wound is a piece of rubber tissue removed entirely on the third day after operation.

6 Fluids are given intravenously during the first twenty four hours. On the third day after operation if there is no evidence of leakage or wound infection the feeding tube is removed and the patient is given a soft diet.

If the operation is properly done there is no loss of blood and no shock and the patient usually sits up or gets out of bed on the second day. The incidence of postoperative complications—shock, pneumonia, cough, and a profuse mucopurulent tracheal discharge—is in reversed proportion to the care with which the above rules are followed.

NOAH D. FABRICANT, M.D.



# THE INTERVERTEBRAL DISC

## A Critical and Collective Review

JOHN B deC M SAUNDERS M B F R C S and VERNET INMAN M D Ph D  
San Francisco California

### INTRODUCTION

THE growth of an extensive and voluminous literature over the past several years testifies to the increasing recognition of the importance of the intervertebral discs. Thanks largely to the pioneer and careful work of Schmorl and his pupils at Dresden impetus has been given to the study of the special pathology of these structures in correlation with the many clinical conditions affecting the spinal column. These newer observations are of interest not only to the orthopedic surgeon and radiologist but also to the neurologist and general practitioner and especially to those concerned with the problems of industrial medicine.

Herein is given a critical review of the literature which presents the normal anatomy, physiology, pathological anatomy and related clinical conditions as a more or less connected account.

Of the more extensive reviews covering the subject of the intervertebral disc special mention should be made of the monographs of Beadle (22) in English and of Mauric (203) in French. These works reflect the important influence of Schmorl who has gathered some 10 000 columns for study at Dresden. In addition attention is directed to the monograph on the vertebral column in health and disease by Schmorl and Junghanns (288).

### ANATOMY

Historically it is to Vesalius (311) in his correction of the observations of Galen that we owe the first description of the main gross essentials of the discs. However it is not until the publication of a monograph by Luschka in 1858 (182) that we find any detailed examination of these structures. With the growing recognition that the major part of spinal pathology involves the discs much of it the outcome of degenerative phenomena considerable study has been devoted to their normal anatomy, development and physiological maintenance.

From the Division of Surgery and Department of Applied Anatomy University of California Medical School S. Francisco California

It should be recognized that the discs comprise as much as one fourth of the total length of the presacral portion of the spinal column. Varying in vertical thickness in different regions they are thinnest from the third to the seventh thoracic vertebra and thickest in the lumbar segment. In equalities in the thickness of their anterior and posterior aspects are in large measure responsible for the characteristic curves of the cervical, thoracic, and lumbar regions. In consequence pathological conditions involving the discs are frequently expressed in modifications of the normal curves. Jacobi (130) in a special study gives details on the measurements of the discs at varying age periods.

To Schmorl whose opinions receive special emphasis from Beadle we owe the conception of the intervertebral disc as a complex functional unit consisting essentially of three parts: the annulus fibrosus, the nucleus pulposus and the cartilage plates.

The cartilage plates cover the bony surfaces of the opposed vertebral bodies. Well defined in the central region peripherally they disappear by blending into the fibers of the annulus. These plates should be regarded as an integral part of the disc bounding it above and below in the manner of a drum head. The relationship which the cartilage bears to the bone of the vertebral body is of importance. This aspect of the bone known as the end plate (Schlussplatte) of the vertebral body is peculiar in that in place of being compact it presents centrally a number of fine perforations which correspond to intra trabecular intervals. It is through these perforations and the cartilage plate that the nutrition of the disc is largely maintained by diffusion (Schmorl, Beadle, Mauric) for the disc is an avascular structure. This is obviously a precarious mechanism and no doubt related to the early degenerative changes which so frequently occur in the discs. Brack (34, 35) has however described vessels in the outer part of the annulus. Schmorl (280) points out that Brack's observations were undoubtedly made on pathological discs, an opinion with which the reviewers would agree.

Confinement of the nucleus pulposus within the disc depends upon the integrity of these cartilage plates, and in this connection the junctional zone between annulus and cartilage plate on the dorsal aspect is of importance.

The annulus fibrosus or lamellosus consists essentially of concentric fibers passing in oblique and spiral arrangement from one vertebral body to the next. Regionally, this arrangement exhibits great variation (Labat, 160, Rouviere, 254). The annulus receives firm attachment into the substance of the adjacent bone by means of the so called fibers of Sharpey. Microscopically, the annulus is composed of fibrous and elastic lamellae and irregularly scattered cartilage cells. Its firmest attachment to bone is anteriorly. The anterior longitudinal ligament, presenting well defined expansions at the level of the discs, blends with the annulus. On the other hand the posterior longitudinal ligament is a poor, ill defined structure supporting the disc in the mid line only and often displaying deficiencies where it is related to the disc.

The nucleus pulposus occupies approximately the center of the disc and is soft and elastic. The transition between annulus and nucleus is indefinite, the one blending into the other. In a young individual, the nucleus is semi fluid and possesses a considerable elastic turgor. It consists of a loose network of fibrous strands with a variable number of cellular elements enmeshed. The cells are mostly fibroblasts and cartilage cells together with a few remnants of the notochord in the form of physaliferous cells of Virchow.

The existence of a rudimentary joint space, as contended by Luschka and Schmorl and contested by Beadle, is still a matter of doubt.

#### DEVELOPMENT AND MALFORMATION

The development of the spinal column has been closely studied for many years both from ontogenetic and phylogenetic aspects. For details on phylogeny the reader should consult the excellent though difficult monograph by Gadow (97). Briefly, in man the column arises by a condensation of mesoderm about the notochord which in the 4 mm stage undergoes division into the segmental sclerotomes. The primitive, or protovertebrae show a tendency to split into cephalic and caudal halves. The caudal half fuses with the cephalic half of the succeeding segment to give rise to theanlage of the permanent vertebrae, the original segmental arrangement being changed for an intersegmental one. Chondrification proceeds in the intersegmental segments, and the mesoderm between the successive blocks of chondral

tissue gives rise to the series of intervertebral discs, which are, therefore, segmental in origin. The nucleus pulposus is derived essentially from remnants of the notochord about which mucoid changes occur. With the ingrowth of vessels ossification proceeds in the cartilaginous vertebrae, first in the neural arches of both sides and slightly later in the vertebral centers. From these vessels fine capillaries pierce the cartilage plates and supply the disc. These vessels, however, undergo progressive regression and atrophy postnatally, and in adolescence are represented by scars only. Details of the arrangement are given by Boehmig (28) and Uebermuth (307, 308). Boehmig attaches great importance to these vessels and to the consequences of their regression. Faults not uncommonly found in the cartilage plates are ascribed to scars left by the obliteration of these minute vessels. In the opinion of these authors these defects are predisposing factors leading to fissuring of the plate and escape of nuclear material.

The notochordal canal is also of importance in the pathology of the disc. Although it is early transformed into a relatively cell free ligament passing through the center of the vertebral body, it may persist and weaken the cartilage plate. (For further details on the primary centers of ossification and the fate of the chordal canal consult Boehmig.)

An important group of anomalies are those which have been interpreted as being due to the persistence of the chordal canal because of their possible relationship to the development of adolescent kyphosis. Persistence of the notochordal canal varies in degree. The more complete varieties are rare. Persistence of the canal over several segments is most common in the thoracic region and usually associated with evident malformation of the vertebrae and some degree of kyphosis. The

butterfly vertebrae of Sereghy (294) no doubt fall into this group, although the reviewers have seen examples of extensive persistence of the chordal canal with but minor deformity of the vertebra. Beadle describes several cases of canal persistence together with instances of dorsal and lateral displacement of embryonic chordal tissue. Minot (209) has traced in various animals the developmental displacements of notochordal tissue. One of the most common pathological findings in the adolescent spine is the presence of hemispherical nuclear expansions, particularly in the thoracic and lumbar regions. These expansions have been interpreted by Schmorl (275) as less in complete closures of the chordal canal, which leave behind areas of congenital weakness and thinning

of the cartilage plates through which nuclear herniation into the vertebral spongiosa may occur.

Great attention has been paid by Schmorl and his pupils to the secondary epiphyses of the vertebral bodies because of their integral relationship to the disc and the production of adolescent kyphosis. In most vertebrates these epiphyses exist as bony plates covering the end surfaces of the centra. In man however, they form simple rings of bone about the upper and lower surfaces of the periphery of the vertebral bodies. These epiphyseal centers appear in the cartilage and fill the furrows found radially disposed on the surfaces of the centra and extending over their outer edges. These several bony centers of ossification appear between the ages of eight and nine years in girls and at the age of thirteen in boys (Beadle) at from thirteen to fourteen years in girls and at fifteen years in boys (Mau, 197) at from eleven to twelve years (Buchman, 39) at from twelve to thirteen years (Lidelstein, 80) at puberty (Cunningham, 65) at sixteen years (Gray, 111) and at from fourteen to fifteen years (Scheuermann, 265). At sixteen years or so they fuse and complete the epiphyseal ring and between the ages of twenty and twenty five years they usually unite with the bodies. Contrary to the generally accepted opinion Schmorl (277) and Beadle regard this epiphysis as in no way analogous to a growth epiphysis. In their opinion it is purely a fixation organ through which the fibers of the annulus receive their attachment to the bone. Keyes and Compere (146) disagree with this view. From personal observations we find little to support Schmorl's contention with regard to growth.

Malformation of the disc may be associated with a wide variety of congenital anomalies of the spine such as anterior spina bifida, hemivertebrae, Klippel Feil syndrome. Complete absence of the disc has been described in otherwise normal spines (Mauric). In such cases which must be distinguished from those with the Klippel Feil syndrome the subjoined vertebrae are fused together. Schmorl and Junghans point out that in the examples of what they term Blockwirbel the fused vertebrae equal in height 2 vertebrae together with the intervertebral disc and that anatomical study of such specimens often reveals small remnants of the disc which cannot be detected in the roentgenogram. Care must be taken to rule out other conditions which result in vertebral synostosis.

#### PHYSIOLOGY

The rôle of the intervertebral disc in the absorption of shock and in the functional control

and distribution of forces, such as pressure, tension and torsion has long been recognized. In addition, the disc permits of and is related to movements of the column. Robin (246), Fick (87), and Calve and Galland (51, 54), among others have demonstrated that the axis of movement of the column over a limited range passes through the nucleus pulposus. Virchow (113), Heuer (125), Bakke (14) and Wiles (315) have studied this question over more extensive ranges. They contend that in flexion the axis passes through the nucleus but that as full extension is approached the axis of movement shifts progressively dorsally. It is agreed that a certain amount of displacement of the nucleus is associated with movements of the column. In flexion there is dorsal displacement in extension ventral displacement and in lateral flexion displacement to the contralateral side although variations in detail are recognized at the various levels. The extent of such displacements of the nucleus is as yet undefined but it would seem to be of importance in certain pathological conditions. For example, Galland (98) has discussed this matter in relationship to the pathology of congenital scoliosis and Mueller (220) in connection with the production of senile scoliosis.

Petter (235) by an ingenious method was able to measure the pressure of the nucleus pulposus in the fresh cadaver, which was found to average 30 lb. for each disc of the lumbar region. When the neural arches of the column are separated *en masse* from the bodies the expansive force residing in the nuclei elongates the anterior segment while the tensile force of the ligaments of the arches shortens the posterior segment. The change approximates 10 per cent of the column (Saunders and Inman). De Puky (73) measured 1,200 individuals, between the ages of five and ninety years, and found daily oscillation in the total height. These oscillations amounted on the average to  $\frac{1}{32}$  in in females and  $\frac{1}{34}$  in in males. The youngest individual showed the greatest daily change, and this value decreased steadily with increasing age. The total height was greatest in the morning and decreased during the day. These oscillations were attributed to changes in the turgor of the intervertebral discs and the findings are of interest in relationship to the work of Uebermuth and Puschel.

Uebermuth (307, 308) basing his observations on histological examination of the discs at various age periods has attempted to trace the life history of the disc. He demonstrates the progressive changes in architecture due to the loss of fluid matrix as a result of which the disc loses elasticity.

which is replaced by firmness. These changes are interpreted as functional adaptations to the demands of the various age periods. Püeschel (238) estimated the water content of both normal and degenerated discs. The content appears to be fairly constant in normal discs from the same individual. It is highest in the newborn (78 per cent annulus, 80 per cent nucleus) and decreases with age at first rapidly and then more slowly. The ratio of the water content of the annulus to the nucleus remains approximately the same until the fifth decade when rapid loss occurs in the nucleus. In degenerated discs the water content corresponds with the degree and type of degeneration. The recognition of a progressive desiccation is important in the interpretation of disc degeneration and in relationship to the maintenance of the spinal curves and the changes as seen in senile kyphosis.

#### DEGENERATION OF THE DISC

The intervertebral discs are subject to continuous and progressive changes of structure throughout life of such marked character as to make it difficult to determine what is normal and what is pathological. Degenerative phenomena are so frequent in supposedly healthy spines at middle age that the changes must be regarded as the outcome of age processes in an organ opposed to relatively violent forces of destruction as represented by functional activity (Beadle). The limits between the normal and the pathological for a particular age are difficult to define and causal factors in pathology are uncertain. Norlen (225) investigated the relationship between arteriosclerosis and disc degeneration and concluded that there was no constant evidence of correlation. Degeneration frequently sets in at an early age (third decade), which suggests predetermined factors. The life history of the disc as drawn by Uebermuth and Püeschel may be conveniently divided into two stages. The first, extending from fetal life to approximately the third decade, is characterized by an increasing turgor and elasticity of the nucleus together with the crystallization of the fibers of the annulus in response to functional stress and strain. The second, from middle age on, is distinguished by progressive dehydration of the disc. The degree of degeneration in any one spine varies from disc to disc. The earliest changes are in the nature of a swelling of the nucleus and its encroachment on the annulus (Beadle) but with normal water values (Püeschel). The disc is, however, more fragile and has lost elasticity. In more advanced stages there is fibrillary degeneration with complete dissolution of the cells and fibers

The annulus is reduced to a peripheral ring and its fibers rupture. The change may be associated with the deposition of pigment, variable in extent, termed "brown degeneration" by Beadle. Necrosis, though less frequent, occurs in the anterior part of the annulus and calcification may occur (Schmorl). These small necrotic areas are often the starting point of fissures or tears of the annulus (Schmorl, and Jänker 133), which are accompanied by hemorrhage when they extend through the cartilage plate into the spongiosa. Through such fissures, material may prolapse posteriorly and undergo metaplasia (Andrae, 9). Such posterior herniations will be discussed more fully because of their important clinical bearing. The cartilage plates may participate in the process of degeneration either by proliferation or by desiccation, or by the development of fissures and cracks with prolapse of the disc tissue into the spongiosa. Such prolapses must be distinguished from those which occur in earlier life and which will be considered under the heading of adolescent kyphosis.

#### LESIONS DUE TO TRAUMA

Whereas trauma is recognized as playing a most important rôle in bringing about the degenerative changes in the disc, only the more severe and violent injuries are discussed in this section.

Naturally, the disc is frequently involved in fractures of the vertebral bodies. Nevertheless, in compression fractures it is striking how much of the damage involves the bone and how little the adjacent discs (Beadle). Schmorl points out that injuries to the disc may take various forms. The cartilage plate may be fractured and lead to massive herniation of the nucleus into the spongiosa. The cartilage plates on the upper and lower surfaces of the body may be damaged, and material escaping from the adjacent discs fuses in the center of the body. These cases are important from the point of view of healing and too early weight bearing. The cartilage plate may be fissured with little damage to the spongiosa with the establishment of Schmorl's "Knorpelknöchen". On the other hand, the spongiosa may collapse without damage to the cartilage plate which is followed by expansion of the nucleus and the formation of an amphicelous or fish-like vertebra, *Ischwärbelbildung*. The annular part of the disc may be crushed in front or at the sides, with or without fracture of the bone. In these instances the centra may later undergo bony fusion with partial obliteration of the disc. An important group of cases to be discussed later are those in which the annulus is damaged posteriorly.

with dorsal herniation of material into the spinal canal, as in the case of Middleton and Teacher (206). An interesting type of disc damage is that associated with marginal fracture of the body of the vertebra. The common anterior position in the fractures is readily appreciated when it is recalled that the annulus has its firmest attachment to the bone on this aspect. Although the chip fracture is insignificant, the fissure involves the cartilage plate and penetrates the disc with loss of its substance and eventual degeneration. This injury must be distinguished from the persistence of epiphyses (Hanson 118, Janker 133, Joisten 134, Junghanns 136, Michajlow and Tcherempina 03) and from epiphyseal damage (Schmorl). The radiological appearance of several of the above types of disc involvement is characteristic.

It is sufficient but to mention that the disc is involved in traumatic dislocation of the spine and undergoes degeneration thereafter. Minor injuries to the disc followed later by the development of small bony spicules in the margin of the disc are discussed by Mouchet and Nidal (218) and Mauric (203), and the question of diastasis is discussed by Hartmann and Monod (121) and Mauric (203).

#### INJURY TO THE DISC IN SPINAL PUNCTURE

It has been amply demonstrated that the nucleus pulposus normally gelatinous in consistency, is confined under considerable pressure. Should the annulus be incised even minutely, the compressed nuclear material is extruded and the disc undergoes degeneration. This has been shown to occur experimentally in dogs, monkeys and rabbits (Keyes and Compere 146, Tammann 306 and Filippi 88). Pease (232) was the first to recognize that similar extrusions followed by degeneration of the disc may occur in man after injury to the annulus by the spinal puncture needle. Billington (25) had however noted thinning of the disc and subsequent changes in the vertebral bodies following multiple spinal punctures in cases of cerebrospinal meningitis. The changes were attributed by this author to the inoculation of meningococci by the spinal needle. Pease demonstrated that a spinal puncture needle if correctly inclined and inadvertently inserted too far would enter the disc and that the loss of nuclear material which followed the injury could be observed in roentgenograms because of the narrowing of the intervertebral interval. Twelve such cases in which varying degrees of pain and disability resulted are reported by Pease. Mihvard and Grout (08) became interested in patients suffering from

pain in the back and legs after surgical procedures in which spinal anesthesia was used. These authors report 5 cases which showed narrowing of the intervertebral interval opposite the level of insertion of a lumbar puncture needle. Localized arthritic changes confined to the injured segment rapidly developed. While believing the penetrating needle to be the initial cause of the changes observed, the authors think that a secondary inflammatory reaction weakens the fibrous wall of the disc and permits gradual escape of the nucleus. There is however ample experimental and other evidence to show that an injury of this type alone is sufficient to account for all the changes noted. Sicard (297) has reviewed this subject fully and points out that in lumbar puncture the disc is more liable to be injured when the spine is fully flexed.

#### HEALING OF THE DISC AFTER INJURY

Several authors have investigated experimentally the problem of healing in the injured disc and the possible connection between injuries of the disc and the development of spondylosis deformans. Human material is naturally inadequate and very little is known on this subject. Experiments have been reported by Keyes and Compere (146), Lob (176), Schrader (290), Tammann (306), and Filippi (88). The animals employed were rabbits, dogs and monkeys. Simple incision of the annulus was followed by immediate extrusion of the nuclear material. The healing of wounds in the annulus was uniformly poor and imperfect and in many instances the gaps persisted for several months. The nuclear material completely disappeared and was replaced by loose connective tissue. This was followed by proliferation of the cartilage of the end plates. In the majority of instances the disc collapsed and the intervertebral space was diminished with limitation of motion. In the animals allowed to survive for six months or longer, the end surfaces showed sclerosis with lipping and bony spur formation. According to Tammann's observations such osteophyte formation was more prone to occur when the disc had been crushed. Keyes and Compere conducted a series of experiments in which the cartilage plate was injured by a drill passed obliquely through the bodies of the vertebrae into the nucleus without damage to the annulus. Nuclear material prolapsed into the spongiosa and was replaced by cartilage which formed nodules similar to Schmorl's 'Knorpelknöetchen'. Thinning of the disc with lipping and spur formation occurred in the animals allowed to survive for some period of time.

## LESIONS DUE TO DISEASE

The discs seldom appear to be involved, either primarily or secondarily, in disease processes, whether they be infectious or neoplastic (Schmorl), with the exception of advanced tuberculosis (Beadle). The cartilage plates are extraordinarily resistant to invasion, although in youth vessels in the plates form possible channels of infection (Beadle). In acute staphylococcal osteomyelitis, invasion of the disc is relatively frequent (Maun), although only in the more destructive processes (Beadle). In the spondylitis of typhoid and influenza the discs are not involved. As the lesion is often subepiphyseal in tuberculosis the discs may be involved early, however, they may escape for some time (Sorrel and Sorrel Dejenne, 302). The discs may be involved in syphilitic spondylitis (Darré 68) and in the late stages of a syphilitic osteoarthropathy (Pape, 231) as well as in syringomyelia (Cornil and Francfort, 62, 63). In osteoporotic conditions of the spine the discs are unaffected and do not undergo degeneration (Norden 225) but as the discs are unsupported they expand and give rise to fish-like vertebrae. The cartilage plate may rupture from the tension with the escape of nuclear material. Benign tumors of the spine do not involve the discs, and the latter seem even more resistant to malignant disease than to infection (Beadle).

CALCIFICATION OF THE DISC—CALCINOSIS  
INTERVETBRALIS

Calcification of the disc has been recognized as occurring in two different sites, namely, the nucleus and the annulus. Each type exhibits significant pathological and clinical differences.

Attention was first called to the possible clinical importance of calcification of the nucleus by Calvé and Galland (49) and numerous examples have been subsequently reported. As early as 1858 calcification has been observed (Luschka 182, Beneke 24). Barsony and Polgar (21) point out that the deposits are usually restricted to the center of the nucleus but may spread to involve the entire nucleus. Radiologically such deposits, even when extensive, show a clear area about their periphery which has been termed the calcium resisting zone (Kalkresistente Zone). This zone segregates the calcified area from the annulus (Barsony and Koppenstein, 20).

The deposits occur typically in the lower thoracic region of patients more than thirty years of age and the maximum incidence appears to be at the tenth thoracic disc. Usually a single or adjacent discs are involved seldom more. Cases have been reported in children in which the cervical as

well as the thoracic discs were affected (Baron, 15, Kohlmann, 153, Hoffmann, 127, and Lyon, 186, 188, 190).

The few deposits which have been observed post mortem have proved to be amorphous. The disc may be well preserved or may show brown degeneration or other forms of atrophy (Beadle). Chemically, the deposits consist of carbonate and phosphates of lime (Calvé and Galland, 53). Schmorl has recovered uric acid from some of them. They have been found devoid of structure, occupying a pseudocavity in the disc. They are no doubt analogous to the calcium deposits found elsewhere in and about joints (Hitchcock, 126), the essential mechanism of which has been admirably demonstrated by Klotz (149). This author has shown that the deposition of calcium is always preceded or accompanied by the formation of soaps in the degenerating tissue, to which calcium is immediately attracted from the body fluids. Such soaps may be found in the peripheral zone of calcareous infiltration while calcium is still being laid down. Replacement of the fatty acid by the stronger phosphoric and carbonic acids ensues and gives rise to the more stable calcium phosphates and carbonates of which these deposits are largely comprised.

Since the initial observation of Calvé and Galland the clinical significance of such deposits is still debatable although the greater proportion of authors claim a definite syndrome. It would appear from the literature that the observations fall into three definite groups.

1 In children the deposits are accompanied by severe local symptoms of backache, muscle spasm and restriction of motion. Constitutionally there is moderate fever and malaise resembling influenza (Baron, Kohlmann, Klar (148), Hoffmann, Lyon) and in Baron's case there was an accompanying leucocytosis of 12,000. Following clinical improvement, often delayed for months, there is gradual absorption of the deposits.

2 In patients over thirty years of age, many authors associate the presence of deposits with symptoms of backache, muscle spasm, and pain which shows a tendency to radiate over the correspondingly affected segments. The radiation is ascribed to pressure on nerve roots by the swelling of the discs. How this occurs is difficult to understand. The radiation of pain unrelieved by rest, support, or position is regarded, chiefly by French authors, as characteristic (Roederer 249, 250 *et al*).

3 There are cases in which the finding of such deposits is purely incidental and unaccompanied by any definite subjective or objective signs re-

lated to the area involved. The reviewers have encountered a number of cases in which the deposits were associated with evidence of degenerative changes at other levels.

As is well known, calcification or ossification is more frequent in the annulus than in the nucleus; the incidence increasing with age. Central calcifications are limited to the region from the fifth thoracic to the first lumbar vertebra, whereas annular calcifications occur throughout the column (Barsony and Koppelman 20). Ritchie (242) investigated 200 columns and found calcium deposits in both the annulus and the nucleus in the ratio of 71 to 65. In individuals less than twenty-nine years old none was discovered in the nucleus but 85 per cent of the specimens examined showed calcium deposits in the annulus. The deposits exist as either amorphous masses of calcium salt or organized bone. When present as the calcium salt they are usually small and often multiple, readily lifted out from the surrounding tissue. When present as bone they are much larger and may attain a considerable size with the formation of a definite spongiosa. Niedner (224) found true bone formation most frequently in the cervical and lumbar spine in 2 per cent of a series of 400 columns. Schmorl has called these deposits *Schaltknochen* and distinguishes them from osteophytes as they are imbedded in the annulus and have no connection with the vertebral body. They are nearly always found in older spines associated with true osteophyte formation. Niedner agrees with Schmorl that they are the result of degeneration. Bufnoir and Legras (13) point out that they are found only in the anterior part of the annulus. Schmorl and his pupils attach no particular significance to these deposits except as evidence of disc degeneration. On the other hand, Mauric believes that they result from the same causes (infection and trauma) and have the same pathology as ossification of the nucleus. Furthermore, he believes that they cause pain and produce spinal deformity when they involve the anterior longitudinal ligament.

In the reviewer's opinion calcification of both the nucleus and annulus is in the majority of instances without clinical significance except as evidence of degeneration, but in younger individuals it may be related to trauma, a distinction, however, which is difficult to make.

#### THE DISC AND SPINAL DEFORMITY

It is evident that alterations in the disc influence considerably the spinal column as a whole, this influence is expressed especially by changes of curvature. Newer concepts of the physio-

logical rôle and life history of the disc have, therefore, led to clearer ideas of the genesis and classification of spinal deformity. Although there is still much that is contentious and many types overlap, these contributions constitute a major advance in an otherwise confused field and any general view of the intervertebral disc necessitates a brief consideration of this effort.

#### ADOLESCENT KYPHOSIS

This deformity is a well defined condition appearing in adolescents from about the twelfth year on and if not due to primary involvement of the disc degeneration of the disc is a marked secondary feature. Clinically, adolescent kyphosis is characterized by the development of a rigid smooth kyphosis with roentgenologically demonstrable changes in the bodies of the vertebrae. These changes consist of irregularities of the margin of the bone opposite the discs which are invariably narrowed. The vertebral bodies assume sooner or later a more or less cuneiform shape. In addition to the kyphosis there is sometimes a slight scoliosis. The dorsal column is most frequently affected although a corresponding condition in the lumbar spine is described (Eckhardt 79 and Lindemann 174), which the reviewers believe is not nearly as infrequent as is thought. French authors stress the presence of pain (Sorrel and Delahaye 301), which is not a universal symptom and is more often in the nature of an ache on exertion. Attention has been drawn to a greater incidence in boys (Scheuermann 26, Mau 199, Boerema 26, Edelstein 80), an incidence which is probably more apparent than real and this opinion is shared by Schildbach (269). The condition shows varying degrees of progression and with early recognition the deformity may be minimized by immobilization. Correction of the fully developed deformity has been attempted but in the general experience has proved unsatisfactory. Late symptoms of back strain, the mechanical result of a rigid segment of the spine are common.

The etiology of the condition is still obscure. First described by Schanz (260, 261) and again by his pupil Elsner (86) it was related to the effects of heavy work on the growing spine and the terms *apprentice kyphosis* (*Lehrjüngers Kypnose*) or *occupational kyphosis* were introduced. The importance of mechanical strain has been especially stressed by German writers. This aspect seems to have been overstated in view of the large number of cases which occur among individuals who have not been subjected to arduous occupations. Lamborn (161) re-

gards shortness of the laminae, by no means always observed, as of prime importance in leading to fracture of the cartilage plates of the disc. Schanz's view has been interpreted, though in correctly according to Eichelbaum (81), as suggesting muscular insufficiency to be the primary cause, and the term "muscular" kyphosis has been employed.

General recognition of the condition, far more common than supposed, is the outcome of the work of Scheuermann (265, 266, 267, 268) who regarded the condition as an epiphysitis analogous to Legg Perthes's disease and who termed it "osteochondritis deformans juvenilis dorsi" (Scheuermann's disease).

Schmorl (275, 282, 285) has brought forward strong evidence which would show that the kyphosis is the direct result of alterations in the intervertebral discs, a view which has received considerable support (Calve, Galland, Beadle, *et al*). He has demonstrated by post mortem evidence that prolapse of the nucleus pulposus into the spongiosa of the vertebral bodies may occur, even in children, as the result of congenital weakness or defect of the cartilage plates. Disturbances of the cushioning effect of the nucleus in overloading and trauma lead to secondary changes in the epiphyses and bodies of the vertebrae. Radiologically, the presence of such hernias cannot always be discovered, which is explained as being due to the absence of reactive changes in the bone, for it is not the prolapse but the bone sclerosis about the prolapse which renders Schmorl's "Knorpelknoetchen" visible. It is true that in many cases these notches become evident only in the later stages of the disease. Schmorl's theory has not been without criticism even by its supporters.

Among other causes suggested have been endocrinal disturbances, nutritional factors, infection, and vascular changes from trauma.

It would seem from the reviewers' experience that all cases do not fall into the same category. Whereas Schmorl's theory offers a satisfactory explanation in some instances, the relationship to sudden spurts of growth has not been considered. In the majority of cases the disc is profoundly affected and many of the changes in the spine are without doubt related to the early degeneration which secondarily affects the discs.

#### SENILE KYPHOSIS

Senile kyphosis has been recognized for many years and grouped in a somewhat confused manner with the deforming conditions of old age. Schmorl recognizing the primary changes as a special type of disc destruction, has segregated

senile kyphosis as a distinct condition. Knaggs (150) had previously drawn up a classification of these deformities in which he specified a type characterized by an upper dorsal curve and atrophy of the intervertebral disc. He called attention to trauma and heredity as predisposing factors and noted that the morbid changes involved more particularly the anterior part of the disc. This type agrees well with Schmorl's "Alter kyphose." Knaggs subdivided this type into spondylitis muscularis and senilis. Beadle, however, in discussing Knaggs' classification, cannot agree that it is possible to separate a form not included under spondylitis senilis, as the disease is one complex developing earlier or later in life.

The characteristic feature of senile kyphosis is the curvature which appears usually late in life and develops rapidly as an exaggeration of the physiological thoracic curve (Alajouanine and Mauric, 4), but differs from the kyphosis of adolescents in that it exists pre eminently in the upper or middle thoracic region (Beadle). The cartilage plates are intact and the discs well preserved in the greater part of their extent without the various degenerative changes of senility. The characteristic pathological feature is necrosis of the anterior part of the disc. Concentric tears with hemorrhage often follow (Schmorl, 281, 286, 288). Eventually the neighboring vertebral bodies come in contact anteriorly, separated by a small amount of disc which shows fibrous infiltration or undergoes ossification. The remainder of the disc, otherwise well preserved, gives the appearance of being incomplete anteriorly in a number of segments, and in these positions the spine is ankylosed. The vertebral bodies become cuneiform in shape, although not as markedly as in adolescent kyphosis. Those cases which show extrinsic disc degeneration and osteophyte formation are considered as impure types exhibiting a coexistent spondylosis deformans (Beadle).

#### SPONDYLOSIS DEFORMANS (SPONDYLITIS OSTEOARTHRITICA)

A clear separation into two types of the so-called rheumatic diseases of the spine on the basis of etiology, pathology, and clinical manifestations, is now well established. In the first, spondylitis ankylopoietica (Bechterew, Marie, Strumpell) or rheumatoid arthritis of the spine (Miller, 207), the lesion is recognized, except by Krebs (158), as being primary in the small intervertebral joints (Fraenkel 94, Elliott 82, *et al*), followed by a smooth ossification of the anterior longitudinal ligament without osteophyte formation. The disease is regarded as infective in origin.



although non specific. The clinical findings are suggestive of such origin and unlike osteoarthritis the sedimentation rate is markedly increased, as in infectious arthritis. Recent work would indicate, however, some association with Vitamin C deficiency (Rinehart 245). In ankylosing spondylitis the discs disappear to a greater or less extent and are replaced by bone.

In the second group spondylitis osteoarthritis the important conception that the condition is primarily the outcome of disc degeneration is steadily gaining ground. Toxic factors are relegated to a secondary position which may serve but to accelerate the process. For this reason the term spondylosis is considered preferable to spondylitis which suggests an inflammatory origin (Schmorl Beadle).

Lane (166) considered that the pathological condition hitherto described as rheumatoid arthritis of the spine and related joints was not due to any disease but was the outcome of occupational trauma. Beneke (4) stressed degeneration of the disc as the exciting cause and contributed interesting observations on the effect of functional stress by reference to the position of osteophyte formation. He pointed out that hip pain predominated on the right side in the thoracic regions and on the left side in the lumbar regions of right handed individuals while the reverse arrangement occurred in left handed individuals. Of the classical studies mention should be made of the careful anatomical and roentgenological investigations on osteoarthritis and ankylosing spondylitis by Hammond (98) and Fraenkel (94).

Little was added to these morphological descriptions until the work of Schmorl and his pupils. Rokitsansky (251) had commented upon the loss of resiliency in the disc with advancing age and Luschka (183) observed some of the changes of senility. However it was only with the contributions of Uebermuth (307 308) Boehm (25) Plesschel (238) and Beadle (22) of Schmorl's group that a clear picture of the life history and physiological maintenance of the disc was established. Other studies are those of Norlen (225) on 300 subjects between the ages of eighteen and eighty nine and of Smith (300) on 57 spines from persons from one to eighty six years of age. Schmorl from his unique collection of some 10 000 spines examined 4 253 for osteophyte formation. The group was composed of almost equal numbers of male and female subjects. The age incidence was about the same in both sexes with a tendency for the condition to be more advanced in males. This incidence is at variance with that of others who report a greater incidence in males. As is

well recognized, osteophyte formation showed a definite relation to age, and it is significant to note an onset as early as the third decade. From the third to the tenth decade in males the percentage with spondylosis deformans was respectively 10 7 36 3 77 9 93 2 97 3 98 4 and 100 0. Spondylosis deformans is viewed as the outcome of a progressive series of events. The discs through age or individual predisposition lose elasticity and under the influence of continuous functional trauma pass through the various stages of degeneration fibrillary degeneration brown degeneration cartilage plate rupture nuclear prolapse necrosis fissuring hemorrhage vascularization, and reactive changes. Loss of turgor permits of increased mobility between the segments with strain of the ligamentous structures loss of the cushioning effect and an increased liability to spinal damage. These effects are followed by osteophyte formation which may proceed to ankylosis. Non appearance of osteophytes posteriorly is accounted for by the less close relationship of the posterior longitudinal ligament to the vertebral bodies (Beadle). The osteophytes occur in and follow the course of the spinal ligaments (Beneke Beadle Weil and Lalanne 314 Gotthelb 110). The experiments of Kees and Compere (146), and Tamman (306) on animals lend strong support to the view enunciated by Schmorl on the genesis of spondylosis deformans.

The fact that degeneration is often early in onset and does not affect all segments equally emphasizes the importance of complete examination of the column in the assessment of spinal disabilities. In addition consideration of the views expressed by Schmorl point the way in this common lesion to a more rational therapeutics.

#### POSTERIOR HERNIATIONS OF THE NUCLEUS PULPOSUS

The significance of posterior herniation of the nucleus pulposus in causing pressure on the contents of the neural canal has of recent years become increasingly appreciated. The evolution of our knowledge of this subject extends over a full quarter of a century. Middleton and Teacher (206) were the first to call attention to the possibility of nerve compression by herniation of nuclear material. Their patient while lifting a heavy object heard a crack in his back and suffered severe pain in the lumbar region which was followed by a paraplegia. Sixteen days later the patient died and at autopsy hemorrhage and softening of the lumbar enlargement were found to be due to a herniated mass of pulp from the intervertebral disc between T12 and L1. Impressed

with trauma as a factor in the displacement, the authors carried out experimental observations on cadavers. By pressure with a vice they were able to force nuclear material through the inner layers of the annulus. This was accompanied by bulging of the disc close beside the posterior longitudinal ligament. They were satisfied that trauma could displace the nucleus in the direction which it must have followed in the victim of the accident. An extensive search of the literature of the time disclosed only one other case of traumatic rupture of the disc, although Virchow (312) had mentioned such a finding. Kocher (151) found the disc between L1 and 2 completely smashed in a patient who had fallen on his feet from a hundred feet. The bodies of the vertebrae were intact but no information on the direction in which the crushed portions of the disc travelled was given. Goldthwaite (109) reported the unfortunate experience of the development of paraplegia in a patient manipulated for low back pain. The possibilities of dislocation of the fifth lumbar vertebra and of dorsal protrusion of the disc were considered, but no definite conclusion was reached.

For many years surgeons had recognized that extradural cartilaginous or pseudocartilaginous tumors were not infrequently encountered, notably in the lumbar region. Elsberg (83) mentions chondromas, fibromas, and exostoses among extradural tumors. In a subsequent paper (84) he states that chondromas comprise 24 per cent of all extradural tumors and, although recognizing their origin as from the intervertebral disc, he regards them as new growths. Moons, Van Bogert, and Nyssen (216) report a definite syndrome from pressure on the cauda equina by chondrochordomas. Stookey (305) published a study on cervical extradural chondromas. Alajouanine and Petit Dutailh (5) described a case of cauda equina compression in which what is called a fibroma of the intervertebral disc was removed by laminectomy. Robineaux (1929) operated upon 2 cases of tumor, one described as a fibrochondroma arising from the disc and the other as an osteofibrochondroma with a preponderance of fibrous tissue. Veraguth (310) removed a partially necrotic cartilaginous tumor from the fifth lumbar disc. Krabbe (156) discusses the autopsy findings in a patient who suffered over a period of fifteen years from symptoms of progressive cauda equina compression. A partly ossified, massive prolongation of the fourth lumbar disc was disclosed. Bucy (42), and Bailey and Bucy (13) discuss a case of sciatica which developed after the patient lifted a heavy object, and in which they found at operation a fibrocartilaginous nodule. Elsberg (85) de-

votes a lengthy article to the subject of extradural chondromas. He concludes that they are not at all infrequent, constituting 36 per cent of all extradural growths, and that the favorite sites are the lumbar and cervical intervertebral cartilages. In Elsberg's view they cannot be strictly regarded as neoplasms for their growth is limited. Appearing to be local hyperplasias, they must be classified from the histological standpoint as *echondroses*. The dividing line between neoplasm and *echondrosis*, he says, is hard to fix, but the term *chondroma* may be sanctioned. Alpers, Grant, and Yaskin (8) review 35 cases of such tumors from the literature, to which they add 1 case of their own. They found that 46 per cent of the tumors occurred in the cervical, 37 per cent in the lumbar, and 17 per cent in the thoracic region. Discussing the pathology they recognize that these tumors, consisting predominantly of newly formed connective tissue, must arise from the intervertebral disc, but they are not sure that they are neoplastic. In about half of these cases there was a definite history of trauma followed by symptoms of spinal cord tumor or compression of a nerve root.

A new phase begins with the report by Dandy (67) of 2 cases presenting symptoms simulating spinal cord tumor, in which he found loose cartilaginous bodies derived from the intervertebral discs. The lesions, he says, were undoubtedly of traumatic origin and the masses resembled the bodies found in *osteocondritis dissecans*. The bodies presented to one side of the midline and were accompanied by swelling and foreign body reaction. He fails to relate them in any way to cases previously reported as ventral extradural chondromas.

Pathologically, posterior herniations of the nucleus pulposus have been recognized by Schmorl (273, 276), Andrae (9), and their coworkers as the outcome of disc degeneration. These authors, while recognizing that such protrusions might produce pressure on the contents of the neural canal, considered this improbable in view of the fact that they were usually small and flattened and occurred beneath the posterior longitudinal ligament. Andrae investigated 368 columns and found posterior cartilaginous nodules (Schmorl's *Knorpelknöetchen*) related to the discs in 56 or 15 per cent. In about half the cases more than one nodule was found at the same level. The greatest incidence was in the lower thoracic and upper lumbar regions and, next, in the lower lumbar region, although none was found in conjunction with the fifth lumbar disc. They occurred occasionally in the lower cervical spine. Initially, Schmorl regarded these

bodies as accessory nuclei pulposi or chordal 'rests'. Luschka (182) had regarded them as chordomas, an opinion with which Virchow disagreed because of the absence of physaliferous cells. In a subsequent paper Schmorl (273) agrees with Andrae that these structures have origin as herniations or protrusions of the nucleus pulposus of the intervertebral disc. In almost all cases in which such nodules were found the disc showed evidence of 'brown degeneration' but the defect through which the nuclear material extruded was not always apparent. In 1 case a definite rent in the annulus through which nuclear material had passed could be demonstrated. These authors concluded that the herniated material underwent metaplasia into cartilage or fibrocartilage which may show calcification or even new bone formation. Such herniations were never found other than posteriorly and in Schmorl's opinion the location of the nucleus pulposus further removed from the front and sides but closer to the back of the disc makes their position intelligible.

Galland (98-99) discussed dislocations of the intervertebral disc in general and the association of retropulsion of the nucleus with paraplegias in particular. Kortzeborn (155) pointed out that the 'Knorpelknötchen' of Schmorl could cause symptoms by pressure on the contents of the neural canal. He described a case diagnosed pre-operatively as spinal cord tumor. On laminectomy later found to be too high; there were no definite pathological findings. At subsequent autopsy however a nodule on the posterior surface of the disc between C6 and 7 was discovered as being responsible for the pressure symptoms. Crouzon, Petit, Dutailly and Christophe (64) reported a case of cauda equina compression following trauma due to the presence of a fibrocartilaginous nodule arising from the disc. Mixter and Barr (212) reported operations in 19 cases of herniations or as they prefer to call it, rupture of the intervertebral disc into the spinal canal with symptoms of spinal cord tumor. This lesion they contend has frequently been mistaken for cartilaginous neoplasm but in their series rupture is more common than neoplasm in the ratio of 3 to 1. In addition they point out the importance of recognition of this lesion in orthopedic cases presenting symptoms of low back pain and sciatica which fail to respond to ordinary treatment, and that in cases of presumptive spinal cord tumor the lesion must always be sought. Peet and Echols (233) reported 2 cases with symptoms of spinal cord tumor in which after operation, the tumors were found to be

composed of nucleus pulposus tissue which had undergone secondary changes after herniation. Mixter and Ayre (211) described a series of 15 cases of nuclear herniations. They accept the view that echondromas, Schmorl's nodules and the herniated masses are identical but report that in the view of their neuropathologist, Kubik both nucleus and annulus are represented in most specimens removed. They believe that the term herniation or rupture of the disc is more descriptive than prolapse of the nucleus pulposus, as used by Schmorl.

With the clearer recognition of the true nature of this lesion together with the finding that such herniations are the major cause of sciatica, case reports and studies have appeared in increasing numbers in the literature of all countries. The following are some who have made such contributions: Maurice (203), Hampton and Robinson (117), Love (177), Schachtschneider (259), Busch and Christensen (44), Hawk (122), Olin (27), Sherwood and Berens (296), Slaughter (209), Love (178), Love and Camp (180), Barr (17), Barr, Hampton and Mixter (19), Brown (38), Schulze (92), Chiasson (58), Kagan (145), Lenschoe (166), Mixter (210), Palmieri (230), Rubino (257), Jaeger (132), Gloneux (108), Hadley (113), Camp (56), Nassiger, Inman and Saunders (222), Love and Walsh (181), Money (214), Fincher and Walker (59), Schapira (264), Sheldon, Carmichael and Adson (293), Barr (18), Poppen (237) and Furlow (96).

Most authors agree that in the majority of instances the protrusion is the outcome of trauma, occasionally single and more often repeated or rather indefinite, such as following falls, bending, lifting or torsion. In a minority no history of trauma can be elicited. It is acknowledged that the lesion occurs most frequently in the lumbar region, notably in the third, fourth and fifth discs, less frequently in the lower cervical and least frequently in the thoracic discs. There can be little doubt that an apparently normal disc may be ruptured in a few instances, but a great deal is to be said for the view that the rupture occurs from the effects of trauma acting upon a disc already weakened by degeneration. This is indicated by the fact that the majority of cases occur in patients in the fourth and fifth decades when as Schmorl has shown degenerative phenomena are common and it is surprising how often a more extensive radiological examination of the spine reveals evidence of degeneration at other levels. It is suggested that in cases of medicolegal importance such a complete examination be made for assessment of the injury. The

somewhat greater incidence in males emphasizes the mechanical factor

For an understanding of the precise mechanism of root pressure and for the exact interpretation of radiological findings, an appreciation of the anatomy of the region is essential. Two studies are devoted to this aspect. Hampton and Robinson (117) investigated the anatomical basis of the normal lipiodol picture and its relationship to rupture of the disc. Naffziger, Inman, and Saunders (222) discuss the detailed anatomy of the region, anatomical factors bearing on the lesions and mechanisms involved. These studies are restricted to the lumbar region. More extensive lesions with symptoms of cord tumor or cauda equina pressure are easily recognized, but lesions of the lumbar region which often involve but a single root and produce symptoms readily confused with disorders of the sacro iliac joint, low back strain, sciatica, and the like are more frequent. The key to diagnosis rests with consideration of the anatomical arrangement and careful radiological methods.

Robinson and Hampton emphasize that after the injection of lipiodol, the lumbar subarachnoid space normally fills symmetrically. In anteroposterior roentgenograms a series of small, triangular shadows are seen on either side of the opaque column. These shadows are produced by the filling of out pocketings of the arachnoid space along the inferior aspect of the emerging spinal nerve. The nerve itself occupies the clear area between the curved shadow of the root of the pedicle, lateral and above, and the triangular shadow of lipiodol, below and medial. The disc lies opposite the upper end of the base of these triangles. Herniations occur at the level of the disc and in consequence deform the dural sac at these levels. Contrary to expectation, the lateral view often gives surprisingly little information. As a rule the diagnosis is not difficult when the defect is large or the canal is completely blocked. In all cases observation of the movement of the oil is essential to locate the defect. In difficult cases knowledge of the normal appearance of filling is a great asset in interpretation.

Reactions following the use of lipiodol in the subarachnoid spaces are discussed by Globus and Strauss (107), Odin Runstrom, and Lindblom (226), Lindblom (173), Harkins (120), Hagueneau (115), and Hampton and Robinson (117). Hampton and Robinson point out that those who use the oil most frequently cite the fewest reactions. However, the possibility of such reactions and the difficulty of completely removing the oil at operation has induced many to employ amounts as

small as 2 c cm for diagnosis. Such small amounts are insufficient to outline the subarachnoid space and make diagnosis more difficult. 1 or adequate filling 5 c cm would seem to be the optimum amount.

The attempt to obviate the potential risks has lead some clinics to use air, as suggested by Dandy (66), for visualization of the ventricles. Coggeshall and von Storch (60) claim to be the first to introduce air myelography. Van Wagenen (309) reported 3 cases of complete spinal block demonstrated by air. Young and Scott (321) give precise directions as to the use of air and report 13 cases, 5 of which were herniations of the nucleus, diagnosed by this method. Stereoscopic pictures are essential for delineation of the sac. These authors conclude that air myelography presents by its transparency certain advantages and is the method of choice. The use of lipiodol, in their opinion, is justifiable only when air studies are negative and there is good clinical evidence of a space taking lesion of the spinal canal. None the less, air myelography has not as yet found universal acceptance because of difficulties in interpretation.

#### SYMPTOMS AND SIGNS

The symptoms naturally depend entirely upon the location and size of the herniation (Mixer and Barr, 212), and many herniations must be asymptomatic as shown by their frequency in post mortem findings (Schmorl, 273, 276, and Andrae, 9). The majority of authors have noted that the symptoms are frequently curiously intermittent in 84 of 100 cases reported by Love and Walsh (181). This is due perhaps to a congestive as well as a mechanical factor (Glorieux 108). Schacht Schneider (259) observed in fresh cadavers partial return of the herniated nucleus in flexion and protrusion with extension, findings which were confirmed by Glorieux (108), and Love and Walsh (181). The duration of the symptoms is extremely variable, from months to years, but usually much shorter in the cervical than in the lumbar region. At cervical and thoracic levels the symptoms and signs are those of extradural tumors. In the lumbar region, the most common symptom is intractable sciatica with or without backache, usually both (Mixer and Barr, 212, Jaeger, 131, Love and Camp, 180, Naffziger, Inman and Saunders, 222, and Love and Walsh, 181). The pain may be aggravated by straining, sneezing, or coughing, although not consistently, and frequently it can be induced by jugular compression. Straight leg raising usually gives severe pain. Hypesthesias, anesthetics, and muscle weakness usually appear

together (Jaeger 131) Absence or diminution of the Achilles reflex is important (Naffziger Inman and Saunders), but it was observed only in 57 per cent of Love and Walsh's cases. A lumbar list toward or away from the side of the lesion may be present. Sphincteric incontinence is uncommon. The sensory motor and reflex changes are usually too indefinite to permit localization of the lesion by physical examination alone. In a considerable proportion of cases the spinal fluid shows an increased total protein content although the absence of an increase does not exclude the diagnosis.

The final diagnosis rests with the introduction of lipiodol into the canal and radiological examination.

### TREATMENT

Treatment is removal of the protrusion by laminectomy which with exact localization can be limited in extent. At times the mass may be difficult to find especially if it extends laterally into the adjacent foramen. The possibility of injury and hypertrophy of the ligamentum flavum producing identical symptoms must be kept in mind (For injuries of the ligamentum flavum see Brown (38) Naffziger Inman and Saunders).

Fixation of the spine by graft is usually not considered necessary, but this matter is still *sub judice*.

### LATE RESULTS

By and large the postoperative results have been good, but it is too early to assess these at this juncture. An odd case of the later development of a false meningocele with herniation of the nerve roots has come to our notice. This was the outcome of the use of interrupted sutures in the dural sac and therefore continuous suture of this structure is advised.

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# SURGERY OF THE NERVOUS SYSTEM

## BRAIN AND ITS COVERINGS CRANIAL NERVES

Lewy F H The Localization of Intracranial Lesions *Ann Surg* 1939 109 28

Pain referred to distant areas is a well known accompaniment of certain conditions. Quite frequently observed but less often recognized is an area of cutaneous hyperesthesia the stimulation of which causes an excessive harassing pain. This pain lasts longer than the causative irritation and spreads into adjacent unstimulated areas. The term hyperpathia has been given to this phenomenon.

The correlation of intracranial lesions and areas of skin hyperpathia was investigated in 100 cases. In 9 of these the lesions were found to be tumors. The exact shape of the skin areas varied and the relationship was found to be an approximate one but the area of hyperpathia gave sufficient indication of the region where the bone flap should be turned down. The majority of brain tumors with hyperpathia of the scalp were situated above at or just below the surface of the brain often involving the meninge directly or indirectly.

Tumors of the cerebellum and of the sphenoid ridge should be localized more accurately than those in other areas. Tumors of the posterior fossa cause a hyperpathia in C 2 4. Deep seated cerebellar tumors producing traction on the tentorium showed in addition or exclusively a circular hyperpathia over the forehead or above the eyes. In tumors of the sphenoidal ridge a sensory examination may be of help in determining whether or not the first division of the fifth nerve is involved.

Other areas of hyperpathia showing less localization were noted. Frontal lobe lesions were associated with hyperpathia of the corresponding side of the forehead medial fossa lesion with an area in the temple and temporal lobe lesions with an area behind the ear. Lesions of the central area caused hyperpathia of the lateral and central areas of the scalp partially overlapping the area associated with parietal lesions above and posteriorly.

This method of correlation is of special value in the differential diagnosis of supratentorial and infratentorial lesions in the finer localization of cerebellar and sphenoid ridge tumors and in the differentiation between neoplasms and vascular processes.

EDWARD S PLATT M D

Wolf A and Cowen D Cranulomatous Encephalomyelitis Due to a Protozoan (Toxoplasma or Encephalitozoon) II Identification of a Case from the Literature *Bull Neurol Inst New York* 1938 7 66

A previous report of a case of necrotizing encephalitis due to a protozoan is reviewed and similar cases appearing in the literature are discussed.

The case previously reported was that of a female infant dying at the age of one month with a widely disseminated encephalomyelitis. Intensive inflammation and necrosis were found in the periventricular white and gray matter and in the cerebral cortex. Miliary granulomas were scattered throughout the central nervous system. A moderate leptomeningitis was present near the parenchymal lesions. Necrotic and caseous patches of chorioretinitis were present in each eye. A protozoan parasite was found in the lesions in the nervous system and eyes.

Five cases from the literature are reviewed because of similarities to the author's case. The case reported by Richter showed parasites in the lesions similar in appearance to those noted by the authors. The parasites were present in two forms as single microorganisms and as a cluster of elements. A typical single element consisted of a small ovoid eosinophilic mass of protoplasm from 2 to 3 microns long and from 1.5 to 2.0 microns wide with a rounded granule of chromatin near one pole. The clusters or cysts measured from 6 to 15 microns in diameter and were composed of many single parasites apparently surrounded by a fine membrane. Since the cysts were observed free in the tissue and also occasionally in the cytoplasm of a swollen cell the nucleus of which was displaced peripherally it is possible that the appearance of a cyst wall may be given by the remaining shell of a parasitized cell.

The identity of the causative organism is discussed and it is left for future investigation and experimentation to determine whether the organism should be classed as a toxoplasma or an encephalitozoon. EDWARD S PLATT M D

Craig W Mch and Kernohan J W Tumors of the Fourth Ventricle *J Am M Ass* 1938 111 2310

Early diagnosis of tumors of the fourth ventricle is difficult because these tumors produce symptoms of increased intracranial pressure. Eighty two cases in which operation was performed have been reviewed in an effort to emphasize any factors which may help in the recognition of the early symptoms and determination of the treatment. Frontal or occipital headache non projectile vomiting ataxia visual disturbances including diplopia and nystagmus and the usual symptoms of intracranial hypertension were the outstanding clinical characteristics.

In the series of 82 cases there were 31 medulloblastomas 21 ependymomas 4 oligodendrogliomas 2 gliomas of the granular layer of the cerebellum 1 epidermoid cyst 3 hemangio endotheliomas 19 astrocytomas and 1 papilloma of the choroid plexus. In most of the cases in which the entire tumor was removed the history indicated that the tumor had been present only a short time. It is also interesting to note that of the 31 medulloblastomas 30 were

removed partially and 1 was removed entirely. Of the 21 ependymomas, 13 were removed partially and 8 were removed entirely. Of the entire group of astrocytomas, only 4 were removed entirely.

The survival period in the cases of medulloblastoma did not seem to depend on the amount of tumor which was removed, nor on the amount of high voltage roentgen therapy given, but on the type of cells found. In the majority of cases of medulloblastoma the period of survival is from nine months to three years, in cases of ependymoma, however, the life expectancy is much longer even in cases in which only part of the tumor is removed.

It generally has been thought that tumors of the fourth ventricle are more malignant than gliomas that are found elsewhere in the central nervous system. This may be, and undoubtedly is true from the clinical and surgical points of view, but cytologically it is not so. It is probably true however that medulloblastomas should be included in the group of highly malignant gliomas. These tumors have a tendency to implant themselves on the walls of the other ventricles and to be disseminated widely throughout the subarachnoid space. Medulloblastomas are supposed to respond better to roentgen therapy than other types of glioma.

Operation for the removal of a tumor of the fourth ventricle can be conducted with the patient in the upright or prone position. If the upright position is used signs of changes in, or instability of the blood pressure rarely develops and the operation can be carried out under either local or general anesthesia. The Cushing cross bow incision has been replaced almost invariably by a simple curved incision which is started below the mastoid process on each side and curved upward to just below the occipital protuberance. In order to obtain adequate exposure of the tumor sometimes it is necessary to divide the vermis. On the other hand when the vermis and the inferior tonsils of the cerebellum are not herniated it is sometimes possible to remove the entire tumor without incising the vermis. It usually is necessary to aspirate the posterior horn of the lateral ventricle before the dura is opened. After the tumor of the fourth ventricle has been removed, air can be injected into the posterior horn of the lateral ventricle when the air bubbles through into the fourth ventricle it demonstrates that the aqueduct of Sylvius is patent. Postoperative drainage is sometimes advantageous and can be accomplished either by means of a catheter which is left in the posterior horn of the lateral ventricle or a small collapsible Penrose drain in the fourth ventricle. Removal of the tumors of the fourth ventricle is carried out with suction and grasping forceps, and the authors have found that with care in controlling the hemorrhage very little electrocoagulation is necessary.

At the Mayo Clinic, the surgeons in general have been taught to and now do expect accurate diagnosis by examination of frozen sections of fresh tissue which have been removed for biopsy, and

they plan their surgical procedures accordingly. The authors have been using polychrome methylene blue to stain frozen sections of fresh specimens of brain tumors for many years and have found it satisfactory. Aside from the fact that they have become used to this method, it has the advantage of allowing study of not only the individual cells but also the architecture of the neoplasm. The relation of the cells to the walls of blood vessels, changes in the blood vessels (especially proliferation of endothelial cells of the intima), necrosis, and mitotic figures can also be studied. The stain does not as a rule demonstrate all the processes of the cells, but if the light which passes through the section is decreased it is possible to visualize most processes. There is little difficulty in arriving at a diagnosis of most tumors of the fourth ventricle with frozen sections of fresh tissue that are stained with polychrome methylene blue. Naturally, all such diagnoses are confirmed by examination of fixed tissues and such special staining methods as are available and seem indicated.

The object of operation in cases of tumor of the fourth ventricle is to relieve the internal hydrocephalus or the increased intracranial pressure and a conservative operation which opens the lower portion of the aqueduct of Sylvius may be followed by temporary relief. However, if the surgeon is made aware of the malignancy of the tumor during the operation his method of attack and his attempt at radical removal are modified by the cytological character of the tumor encountered.

There is probably no other group of tumors in which postoperative irradiation is as important as in the tumors of the cerebellum and fourth ventricle. At times one is dealing with a tumor which is highly radiosensitive that is a medulloblastoma and it may have been suggested that no operation be done, but that the patient should be subjected to at least three courses of irradiation. In some of the foreign clinics, whenever increased intracranial pressure without localizing signs develops in a child irradiation without operation is advised. We do not agree with this procedure because some tumors of the more radioresistant type, with histories which reveal that they have been present only a short time, can be removed and a cure accomplished. However in view of the fact that the majority of tumors which occur in the posterior fossa during childhood are medulloblastomas irradiation after operation is usually indicated.

### SPINAL CORD AND ITS COVERINGS

Zeno L. The Treatment of Spinal Cord Injuries (I estado actual del tratamiento en los traumatismos raquimedulares) *An de cirug* Rosario 1938, 4 1938

The author after some theoretical and clinical considerations of his concept of the injuries and fractures of the spinal cord, summarizes his ideas about the treatment of these injuries in the following manner

Uncomplicated or complicated fractures of the cervical spine should be treated by means of reduction quick gradual correction radiological control and fixation in hyperextension by application of a Thomas collar

The reduction is obtained through zenithal traction Local anesthesia is not necessary If there is a quadriplegia the patient is seated with his trunk tilted forward The cephalic plane is held in a horizontal level so as to determine the hyperextension of the spine The patient is sustained by the cephalic suspension and by a bandage applied between the thorax and the chair If necessary a nurse can support the arms in full abduction The zenithal traction is made by means of an occipitomenthal sling If the part belonging to the chin is put against the superior front teeth the patient will be more comfortable The skeletal traction from the parietal bones with ice tongs of the Boehler type is a real progress

If the patient is in a state of shock the zenithal traction cannot be done In this case permanent traction with an inclined bed must be done by means of skeletal traction in the Crutchfield way Once the shock is over the hyperextension can begin and as soon as the radiological controls show the necessary reduction fixation is accomplished with a Thomas collar Zeno thinks that besides the complicated spinal ligamentary system the muscular tonus is an element that even under narcosis hinders a too large separation of the fragments which might endanger the integrity of the cord

In injuries of the dorsal and lumbar spine the reduction maneuvers are inspired by the x ray findings which must be as precise and perfect as possible The patient must be very carefully examined so that any other lesions that may require a surgical procedure before the reduction (ruptures of the liver kidneys and spleen) may be brought to light

One must not try to reduce the fracture during shock as the state of the patient may be aggravated

The experience of the author induces him to say that the general principle of the zenithal traction is useful in this type of fracture even in cases with a hazy displacement or with an important dislocation He believes that this form of traction is tolerated better than the reduction in a recumbent position The vertical traction alone does not allow a correction in hyperextension However this position is possible by means of an oblique position of the patient under suspension as in cervical lesions

The vertical traction would hinder the complications that have been described by some authors and originated in the comminuted fractures by the displacement of some fragments toward the spinal cord during the reduction in hyperextension

The author does not try to produce fixation immediately in hyperextension This position is not imperative at first besides it very often brings pain which sometimes becomes intolerable especially by distention of the abdomen If the hyperextension seems to be indispensable it can be done in four or five days thereby sparing the patient a very unpleasant experience The benefits of a plaster fixation must not be forgotten

Once the cast has been set and as soon as the patient recovers from the psychic shock the ambulatory and functional treatment can begin Also in some special cases and as a psychic stimulant the patient can start to walk with the help of a rolling support If there is urinary retention the suprapubic drain made with a vesical fistula is preferred

In the transverse fractures the author corrects the analgic position with local anesthesia and then fixes the spine with a cast The patient is allowed to stand up and walk at once with good results Some very interesting reports show the results of this method

HECTOR MARINO MD

# SURGERY OF THE THORAX

## CHEST WALL AND BREAST

Dunphy J E The Surgical Importance of Mammary and Subcutaneous Fat Necrosis *Arch Surg* 1939 38 1

A thorough knowledge of the pathogenesis and clinical manifestations of fat necrosis is of considerable surgical importance because all too frequently the similarity of this condition to cancer has led to ill advised surgical intervention or irradiation therapy. This is true particularly of fat necrosis in the breast. However fat necrosis may prove to be equally baffling when it occurs in a mastectomy scar in a lipoma in a hernial sac, or deep in the subcutaneous tissues of the thigh or buttock.

The condition has been described under a number of titles of which the most familiar are traumatic fat necrosis, ischemic fat necrosis and lipogranulomatosis. Since fat necrosis is not a true granuloma and since it may occur independently of proved trauma or ischemia it seems better to designate it according to its anatomical location as mammary or subcutaneous fat necrosis.

Usually fat necrosis appears as a solitary lesion, but its lesions may be multiple especially in the newborn. In such patients it must be distinguished from sclerema and scleroderma neonatorum. It is a well defined entity it is almost certainly the result of trauma, and in contradistinction to scleroderma neonatorum it has a uniformly good prognosis. In the adult multiple areas of fat necrosis are of rare occurrence but they have been described as following infectious diseases. It is possible that such multiple areas of fat necrosis are the result of ischemia due to vascular lesions. Christian Weber disease is included in this classification by some authorities.

The exact factors involved in the development of solitary lesions of fat necrosis have not been established. The lesion may arise after trauma after the injection of foreign material especially fats and oils after interference with the blood supply to a part or after infection. However if any of these factors alone is sufficient to produce fat necrosis it is difficult to understand the comparative rarity of the lesion when one considers the frequency of trauma to and infection in subcutaneous fat. It seems likely therefore that in addition to these various exogenous factors an endogenous factor is essential for the production of fat necrosis. The nature of this endogenous factor is hypothetical, but it may be a blood or tissue lipase which is more abundant or more easily activated in certain persons than in others.

The presence of fat crystals alone is not of sufficient histological evidence to warrant a diagnosis of fat necrosis. Also after the injection of foreign material especially fats and oils an intense foreign body reaction may be observed, such a reaction is

not necessarily fat necrosis. In certain cases this foreign body reaction becomes a progressive lesion which possesses the essential histological features of fat necrosis but this is not always the case. The dissolution of normal fat cells into confluent spaces seems to be an essential characteristic of true fat necrosis. It apparently represents one of the earliest histological changes. Within these spaces are the products of decomposing fat which usually excite a mild but slowly progressive foreign body reaction. This is characterized chiefly by an infiltration of mononuclear phagocytes, many of which become filled with particles of necrotic fat. These so called foam cells are found about the periphery of the broken down fat. This is followed by proliferation of the surrounding connective tissue and to some extent, of the fat cells. The cellular infiltration may be heavy and in addition to the mononuclear phagocytes there may be numerous lymphocytes plasma cells and occasional polymorphonuclear leucocytes. In early fat necrosis a stage not often seen histologically, polymorphonuclear leucocytes may be numerous. In a later stage giant cells frequently constitute a prominent feature so that, in some instances the lesion bears a superficial resemblance to tuberculosis. More commonly however as the lesion develops one finds many cyst like areas of necrotic fat surrounded by mononuclear phagocytes and giant cells and separated by broad bands of proliferating connective tissue. These cystic areas may become macroscopically visible but rarely exceed 1 cm in diameter.

Obliterative endarteritis is occasionally associated with fat necrosis particularly in the late stages. In some cases such vascular changes may constitute the causative factor. Usually however, the obliteration of the vessels is an accompaniment of the contraction and hyalinization of the connective tissue which occurs throughout the area of fat necrosis. In the very late stages the cellular reaction may completely subside, leaving only the cyst like areas which are surrounded by dense hyalinized acellular scar tissue. In this stage areas of calcification are not uncommon.

The gross appearance of fat necrosis varies considerably according to the stage in which it is observed. In the very early stages of fat necrosis the lesion may occupy exactly one or two fat lobules appearing as a sharply demarcated, opaque area which stands out prominently against the normal fat which surrounds it. It is soon followed by a central liquefaction of the lesions and then one finds a poorly demarcated edematous area of fat in which minute cystic spaces are visible and from which yellow oily material may be expressed. Later the induration becomes more striking and the cut surfaces of the lesion contain well defined cavities filled with serous fluid, oily, necrotic fat, or a grayish

white chalk like debris. As the amount of connective tissue increases a more homogeneous grayish white appearance develops. There is also a gritty consistency so that the tissue resists the blade of a knife in a manner much like that of scirrhous carcinoma. Even in this stage it is not likely that the experienced observer would mistake fat necrosis for carcinoma but to one not familiar with it or not suspecting it the condition may prove deceptive. It is possible to interpret areas of necrotic fat as tumor and the correct diagnosis may be in doubt until a histological diagnosis is made. Consequently a biopsy with histological examination of the tissue should be performed for suspected malignant tumor in those areas in which fat necrosis usually is encountered.

The incidence of fat necrosis cannot be accurately estimated because the lesion in many cases is not recognized. A considerable number of such lesions are treated as carcinoma. In the department of pathology of the Peter Bent Brigham Hospital Boston the diagnosis was made ten times between 1923 and 1937. A study of a number of lesions of fat which had been diagnosed as chronic infection revealed 6 additional cases.

Twelve of the patients were females and 4 were males. The age incidence varied from sixteen to sixty eight the average being fifty. One patient was in the second decade of life, 3 were in the fourth, 6 in the sixth and 4 in the seventh. There seemed to be no relation between occupation and the development of fat necrosis. All of the patients were white except 1 who was a negro. Six were described as obese, 9 were well developed and well nourished and 1 was of thin asthenic habitus. In the latter patient the lesion was secondary to chronic infection. As one would expect those patients who have an abundant panniculus are more susceptible to fat necrosis. The duration of the lesion is of no striking diagnostic importance. In the present series the nodule had been known to be present for periods varying from ten days to five years before operation had been performed. A history of some form of trauma was mentioned by only 6 of the 16 patients. Only 1 of the patients had syphilis. None had diabetes. In 6 a clinical diagnosis of carcinoma was made and in 2 radical surgical operations without biopsy were done.

The series reported is representative of the various locations in which fat necrosis may arise. Of these the breast assumes by far the greatest importance. In this location fat necrosis appears as a firm often painless nodule which gradually or sporadically makes rapid increase in size. It may be situated in any quadrant of the breast. A definite history of trauma has been obtained in only 30 per cent of the reported cases. In more than 50 per cent the lesion has been adherent to the skin and occasionally the typical peau d'orange appearance of cancer has been observed. In 10 per cent there has been retraction of the nipple and in about the same proportion the lesion has been adherent to the deep tissues of the

chest wall. A clinical diagnosis of fat necrosis of the breast is occasionally possible particularly if after trauma to the breast a mass has developed rapidly and no involvement of the axillary lymph nodes is found. More often however the lesion is much like carcinoma in appearance and only unusual circumpection will prevent an error. This means that for even a typical carcinoma of the breast a biopsy must be performed and histological examination by means of frozen sections must be made before radical surgical treatment is given.

The development of fat necrosis in a mastectomy scar presents even greater difficulties in diagnosis particularly if the mastectomy has been performed for carcinoma. There were 2 such cases in the present series and it is likely that the condition is more common than has been realized. In this situation fat necrosis appears as a hard irregular nodular growth which is usually fixed to the chest wall. Unless the possibility of fat necrosis is kept constantly in mind a diagnosis of recurrent carcinoma is inevitable.

Biopsy and histological examination of the tissue should be performed before surgical intervention or irradiation is employed in the treatment of a lesion suspected to be a recurrent carcinoma of the breast. It should be noted that fat necrosis may not develop for months or even years after trauma to the normal breast. Hence in cases in which fat necrosis occurs in mastectomy scars the length of time after operation which elapses before the lesion develops may be variable.

Elsewhere in the body fat necrosis is less likely to be mistaken for a malignant neoplasm but it may prove a baffling lesion.

Fat necrosis may occur (1) in an old incarcerated hernial sac, (2) in a lipoma and (3) at any place where a nodular lesion develops after trauma or long standing infection. In an old incarcerated hernial sac either the omentum or the peritoneal fat is involved. Usually the condition manifests itself as a moderate induration of the fat and does not attract the attention of the operator but in 1 case there was a solitary whitish gray firm nodule fixed to the under surface of the hernial sac. It strongly suggested the seeding of an intra abdominal tumor and it might easily have led to an unnecessary exploration of the abdomen if its true nature had not been suspected and the diagnosis confirmed histologically. In a lipoma areas of fat necrosis may impart an irregular nodular consistency to the tumor causing it to be mistaken for a sarcoma.

The development of carcinoma in areas of chronic inflammation is a fairly common clinical observation. It is not generally known however that occasionally fat necrosis may arise in or adjacent to such areas. In the present series there were 3 instances of such origin but in each case the small tumor mass which developed was interpreted as an indurated abscess cavity rather than a neoplasm. However in view of the similarity which fat necrosis bears to neoplasm elsewhere in the body it is not

unlikely that in certain cases it may also simulate malignant disease in this situation

SAMUEL KAHN MD

### TRACHEA, LUNGS AND PLEURA

Cann R J Basal Celled Carcinoma of the Trachea *Guy's Hosp Rep Lond* 1938 88 392

The history of 2 cases of basal celled tracheal tumor was recorded together with a report on treatment and progress to date. The value of roentgenology of the trachea after the introduction of lipiodol was demonstrated, in 1 case the tumor was clearly outlined and its exact level shown.

Treatment of carcinoma of the trachea was also considered. One of the 2 cases was treated by deep x ray therapy, the other by teloradium. In each case the tumor had apparently disappeared and obstruction had been relieved.

The pathology of carcinoma of the trachea was discussed and it was demonstrated that one of these tumors probably arose from the basal layer of the tracheal mucosa while the other probably arose from a mucous gland situated deep in the tracheal wall. The latter resembled closely the structure of the mixed tumors occurring in the parotid and other salivary glands.

PAUL MERRELL MD

Lardnells, G Monod O and Garcia Bengocher, J Extrapleural Oleothorax (L oleothorax extra pleural) *Ann med chir Par* 1938 3 317

This report emphasizes the danger of repeated intrapleural oleothorax in patients with active tuberculous lesions in whom pneumothorax has been found to be ineffective. The authors have tried extrapleural injections (i.e. into the lung cavities themselves) of iodized oil and have found the results to be satisfying. They prefer to make repeated injections of small quantities of the oil leaving an air space above, and they have found healing to be rapid and complicated by few or no ill effects of the oil. They use a small amount of iodized vegetable oil combined with a larger quantity of gomenol. Eventually, with healing and filling out of the cavity by lung expansion the oil is absorbed completely. This alone makes its use preferable to paraffin.

In the opinion of the authors, oleothorax has for its object the avoidance of too rapid a collapse of the cavity. It is blockage therapy not intended to be a substitute for insufflation, but to be used as a forced measure of necessity when the eventual result of thoracoplasty may be unsuccessful.

JOHN MARTIN MD

Letulle, R Micro Organisms of Abscesses of the Lung (Les microorganismes des abcès du poulmon) *Presse med* 1er 1938 46 1779

Letulle notes that the organisms causing abscesses of the lung are of two main types: pyogenic organisms, including bacilli and entameba histolytica and anaerobic organisms, including the anaerobic bacilli and spirochetes.

The pyogenic bacilli most frequently found in pulmonary abscesses are pneumococci, streptococci, enterococci, staphylococcus aureus, and the Friedlaender pneumobacillus. The clinical characteristics of pulmonary abscesses due to these various organisms are not distinctive except in the case of the Friedlaender bacillus. It may sometimes be difficult to differentiate the pneumococci isolated from the pus of a pulmonary abscess from streptococci unless they are typically encapsulated. In such cases they are best differentiated either by the Neufeld test (lysis of pneumococci by bile) or by animal inoculation. The streptococci in pulmonary abscesses are chiefly of the viridans or the hemolytic type. Pulmonary abscesses due to the Friedlaender pneumobacillus may almost be called diffuse abscesses: the lesions are markedly necrotic and hemorrhagic, if the patients survive there is usually extensive cicatrization or cavity formation.

Pulmonary abscess due to entameba histolytica is usually secondary to hepatic abscess but may be caused by an amebic embolus originating in the intestines. In either case the abscess is necrotic and hemorrhagic and the expectorated pus viscid and dark colored. The ameba can be demonstrated in the expectorated pus only if examination is made when the specimen is freshly obtained.

The anaerobic flora found in pulmonary abscesses is abundant and varied among the anaerobic bacilli are the bacillus perfringens, bacillus ramosus and bacillus fusiformis, the anaerobic streptococcus and the spirillum nigrum. Pulmonary abscesses due to these anaerobic organisms are characterized by septic necrosis and a putrid odor of the breath. These anaerobic organisms alone may produce septic necrosis or gangrene of the lung, but they are also frequently associated with spirochetes. The spirochetes of pulmonary abscesses and gangrene show marked polymorphism: some authorities consider that these spirochetes are of the type of spirocheta bronchialis described by Castellani; others that they are Vincent's spirochetes found in association with the fusiform bacilli in Vincent's angina and other lesions of the upper respiratory tract.

ALICE M MEYERS

Brock R C and Cann R J Experiences with the Use of Intra-bronchial Radon in the Treatment of Bronchial Carcinoma *Guy's Hosp Rep Lond* 1938 88 371

Bronchial carcinoma is a relatively common disease and usually of such an insidious onset that by the time the correct diagnosis has been made the sufferer is almost always beyond the help of any but the simplest of palliative measures. Of 106 consecutive cases studied by the author, 93 were considered to be inoperable. In view of this high percentage of patients unsuitable for radical surgery, it is important to consider the value of other methods of treatment in the relief of symptoms and prolongation of life.

Yankauer, in 1922, was the first to use radium by intra-bronchial surface application. In 1924 Green

reported a case in which he inserted radon seeds directly into the substance of an intrabronchial polypoid tumor. Tudor Edwards in 1920 introduced some special radon seed containers which could be left in place for as long as a week. A central lumen allowed air and secretions to pass through the seeds being held in four grooves in the wall over which an outer case was fitted. The original tubes were made of German silver and experience showed that the imperfect screenage and secondary radiation were dangerous. For this reason the authors state they had tubes made with an outer protective sheath of platinum and this with another sheath of platinum covering each seed made a total of 0.6 mm of platinum screenage. They found it necessary to employ a large tracheoscope for the instillation of the tubes.

The dosage advised by Edwards was 1 seed of 1.5 mc strength to be left in place for from five to seven days. The authors state they had been using seeds with a strength of 1 mc which often measured as high as 1.25 mc rather than those having a strength of 1.5 mc which were often found to have an actual strength of 1.8 or even 2 mc. The container is left for seven days. Certain disadvantages are inherent to the use of radon as opposed to radium: (1) the uncertainty and variability of the dosage and (2) the rapid diminution of strength.

Twenty-five cases were treated by the authors and they describe 6 of them. It is pointed out that the best results from intrabronchial radon therapy are to be expected in cases of squamous cell bronchial growths in elderly men which are rather slow growing. Intrabronchial radon should not be used in preference to radical surgery in a patient who is fit or suitable to undergo operation.

PAUL MERRELL M D

Dorlman L. L. The Fate of Remaining Portions of the Lungs and Stump Shortly after Lobectomy and Pulmonectomy. *Leistikoln* 1938 56 194

The author studied the effect of lobectomy or pulmonary resection on the remaining portions of the lungs by experimenting on 17 cats. The operation was performed under a combined ether chloroform anesthesia and artificial respiration. For the latter purpose either a tracheotomy or intubation was used and the cannulas were connected with a suitable apparatus. The pleural space was entered through a curved incision in the fifth or sixth intercostal space; a silk ligature was applied to the main bronchus and one lobe or the entire lung was removed. The wound was closed without drainage with a continuous catgut stitch including the adjoining rib and interrupted silk stitches were applied to the skin.

Histological studies of the remaining lung or stump were made at various times after the operation. The experiments were supplemented by similar operations on 6 dogs. The author comes to the following conclusions:

A wide exposure of the chest cavity, an excessive separation of the ribs, tension on the lobe to be removed and its ligation at the hilus cause in the majority of cases a sudden cessation of respiration and an increase in the cardiac rate. The removal of one or several lobes causes a compensatory hypertrophy and emphysema of the remaining portions of the lung and a new formation of elastic fibers in the interalveolar septa. Starting within the first twenty-four hours after the lobectomy a necrosis of the stump develops and lasts a long time. In one instance signs of necrosis were detectable one and one-half months after the operation. The process of cicatrization begins only toward the end of the second month. The long duration of the necrosis may be responsible for a purulent pleurisy but in many instances adhesions between the pleura and the stump prevent such complications.

JOSEPH K. NARAT M D

## HEART AND PERICARDIUM

Gross R. E. and Hubbard J. P. Surgical Ligation of a Patent Ductus Arteriosus. *J Am M* 1939 112 739

The authors report a case of a girl seven and one-half years old who was known to have a patency of the ductus arteriosus and a beginning cardiac hypertrophy. They performed an operation in the hope of preventing subsequent bacterial endarteritis and with the immediate purpose of reducing the overwork of the heart caused by the shunt between the aorta and pulmonary artery. The ductus was surgically explored and ligated. The patient stood the operative procedure exceedingly well and showed no signs of shock. There was only a mild discomfort on the afternoon of the day of operation and on the following day the child was allowed to sit up in a chair. On the third day she was walking about the ward.

The most marked objective finding which indicated that the serious loss of blood from the aorta into the pulmonary arteries had been arrested by operation was obtained by a comparison of the preoperative and postoperative levels of the diastolic blood pressure. Prior to operation the daily blood pressure showed an average diastolic level of 35 mm of mercury but after operation the diastolic level quickly went up to 80 mm of mercury. This is the first patient in whom a patent ductus arteriosus has been successfully ligated.

J. DANIEL WILLEMS M D

Bigger I. A. Heart Wounds. *J Thoracic Surg* 1939 8 239

The author discusses the treatment of patients with heart wounds and records 4 illustrative cases in detail. He also suggests a plan whereby such cases may be divided into 4 groups depending upon whether there is free communication with the pleura or tamponade and also upon the blood loss and the severity of the tamponade.

Patients in whom there is free communication with the pleura but only slight or moderate hemorrhage are classified as belonging to Group I and treated conservatively.

Group II includes those patients with tamponade, but in whom there is marked improvement including a rise in blood pressure to near normal following venoclysis, adrenalin, and morphine. These patients are prepared for operation but before the operation is begun a cannula is inserted into the pericardium, the pressure is obtained, and if possible sufficient blood is removed to decrease the intrapericardial pressure appreciably. The cannula is then left in place for from fifteen to thirty minutes to determine whether or not there will be a rapid recurrence of the tamponade. If it recurs promptly, operation is done but if the pressure remains low conservative treatment is continued.

Group III includes those patients with greatly increased intrapericardial pressure, who do not show a satisfactory response to conservative measures and who continue to have a low arterial pressure. They should be operated upon without delay.

Group IV includes those patients with free communication to the pleura and massive intrapleural hemorrhage. They should be operated upon immediately, and reinfusion of the blood in the pleural cavity should be undertaken while an attempt is made to control the hemorrhage. The number of patients who will survive from this type of injury is small.

The author also finds in response to a questionnaire which he sent to members of the American Association for Thoracic Surgery, the American Surgical Association, and the Southern Surgical Association that of 141 patients with heart wounds operated upon by the members of these associations 71 recovered and 70 died. Thus he considers a very accurate index of the chances of recovery following operations for heart wounds.

J. DANIEL WILLEMS M.D.

## ESOPHAGUS AND MEDIASTINUM

Illynn R. Achalasia of the Esophagus. *Australian & New Zealand J. Surg.* 1939 8 244

Achalasia of the esophagus ranks next in frequency to carcinoma as a cause of esophageal obstruction. In this lesion, the absence of relaxation of the cardiac sphincter in the act of deglutition causes food to be retained in the esophagus the peristaltic force of which is not sufficient to overcome the resistance of the sphincter. This resistance in achalasia can be overcome only by a pressure equal to about 20 cm. (8 in.) of water. Consequently, no food will pass the sphincter until this pressure obtains, at which time the cardia opens and allows food to pass until the weight of the column of food is reduced to less than 20 cm. or approximately equal to a column of food 8 in. above the cardia.

Various theories and descriptions of this condition have been given since Purton first reported the syn-

drome in 1821. The earliest plausible approach to the etiology was the conclusion of Einhorn in 1888 that there was a "lack in the reflex relaxation or opening of the cardia during the act of swallowing." He pointed out that Kronecker and Meltzer had shown that "every act of swallowing easily opens the cardia by reflex action." Hurst in 1913, in the course of a discussion said that after examining the specimens of so called cardiospasm in the museum of Guy's Hospital, he had come to the conclusion that the condition could not arise from a spasm of the cardiac sphincter which was the commonly accepted view. As the symptoms were often present for many years before death, it was quite inconceivable that a spasm of such long duration should not lead to hypertrophy of the cardiac sphincter. Yet in all the specimens he had examined, the absence of hypertrophy of the cardia and the absence of any obvious obstruction after death had been in striking contrast with the degree of hypertrophy of the esophageal wall. As a result of these observations, he came to the conclusion that the condition was due to the absence of the normal relaxation which should occur when each peristaltic wave traveling down the esophagus reached the cardiac sphincter, or, in other words to an incoordination or, as Parkes Weber suggested, a dissociation of the neuromuscular mechanism of the distal end of the esophagus.

It was observed that as a result of this incoordination or dissociation the esophagus becomes atonic, dilated and elongated and reaches a maximum diameter immediately above the diaphragm, or it becomes S shaped with the dilated portion lying over the right dome of the diaphragm. The dilatation generally extends as high as the third dorsal vertebra.

Acting on Hurst's impressions, Rake, in 1929 demonstrated in 6 cases well marked inflammatory and degenerative changes in the lower end of the esophagus particularly involving Auerbach's plexus.

The nerve supply to the esophagus is still a matter of controversy. The most complete study was published by Knight in 1934. He concluded that the esophagus receives a sympathetic innervation. There is a true intrinsic sphincter at the cardia and vagal stimulation augmented by sympathetic stimulation causes tetanic contraction of the striped muscle composing the upper third of the esophagus. Vagal stimulation causes increased tonus and mobility of the plain muscle of the lower third of the esophagus but this is inhibited by sympathetic stimulation. Complete bilateral vagal section reproduced achalasia of the cardia and simultaneous removal of the sympathetic fibers prevented it. When achalasia develops, it is thought that section of the sympathetic supply to the sphincter of the cardia where it passes to it from the celiac axis and left gastric arteries will relieve it.

The disease occurs in both sexes equally often, and in patients of all ages. Moersch reported the onset of symptoms before the age of fourteen years, and in Plummer's series, the average age of onset was



twenty nine years. The course of the disease may be divided into three stages (1) achalasia without regurgitation of food characterized clinically by a complaint of discomfort behind the lower end of the sternum (2) achalasia with immediate regurgitation of food and (3) achalasia with dilatation of the esophagus retention of food in the esophagus and its regurgitation at irregular intervals after ingestion usually unmixed with gastric juice but commonly mixed with mucus and saliva. An associated clinical finding which is most constant is hypertrophy of the salivary glands especially the submaxillary glands.

A diagnosis of achalasia of the esophagus should not be made without roentgenographic evidence of obstruction at the cardia. Psychoneurotic individuals complain of retrosternal pain and obstruction to swallowing food without roentgenographic evidence of obstruction. The kymogram will show the lower end of the esophagus ending in a perfectly smooth funnel. The passage of a No. 45 Charrière olive tipped tube over a previously swallowed silk thread without more than slight resistance at the cardia is confirmatory evidence. Occult blood is never found. An ordinary bougie should not be passed since perforation of a weakened esophagus may result. Achalasia should always be considered in the differential diagnosis of dysphagia.

The safest methods of treatment consist in the application of dilating procedures by the passage of the Moersch metal olive or the hydrostatic dilator of Plummer with a silk thread for a guide. A number of experimental operations have been performed but all run the risk of mediastinitis. In all of the 8 cases of achalasia of the esophagus reported in some detail by the author dilatation was carried out on 1 occasion only and resulted in functional restoration of the normal swallowing mechanism in each case.

JOHN L. KIRKPATRICK, M.D.

#### Turner, C. C. Non Malignant Stenosis of the Esophagus. *Brit J Surg* 1939 36 555

The greater number of cases of non malignant stenosis of the esophagus are due to the swallowing of corrosive solutions. The condition may also follow the healing of trauma associated with foreign bodies or with attempt at their removal. Stenosis may also follow the healing of an ulcer a peptic ulcer at the lower end of the esophagus may heal with the development of a fibrous stricture and similarly the cicatrization of a high lying gastric ulcer may leave a scar involving the lower part of the esophagus. Other causes may be healing secondary to invasion of the esophagus by an infected mediastinal gland inflammation spreading down along the esophagus from the pharynx diphtheria scarlet fever typhoid fever and the vomiting of pregnancy. Some cases may have their origin in a congenital narrowing of the esophagus with sclerosing changes in later life and finally some may be dependent upon achalasia. In the 19 cases referred to in this paper, the causation so far as it could be

ascertained was as follows congenital malformation 5 corrosives 5 late results of achalasia 4 ulceration 2 and acute inflammation 1 in 2 cases it was undetermined.

The usual sites for simple strictures of the esophagus are well recognized as being at the junction of the pharynx with the esophagus at about the crossing of the left bronchus and at the termination of the esophagus. However such a stenosis may extend along the esophagus for a considerable distance or there may be multiple strictures.

This is usually the question of gradually increasing dysphagia until such time as the patient develops extreme difficulty in swallowing even water. Superadded spasm may produce variations in the severity of the symptoms.

Diagnosis is usually not difficult. Our newer methods such as contrast x ray examination esophagoscopy and biopsy help differentiate the condition from malignant stricture.

The treatment of most strictures is largely a matter of the proper use of bougies. This should be the first and main method of treatment in all cases whether carried out under the guidance of the eye through the esophagoscope or without its aid. Traumatism from over dilatation or tearing must be carefully avoided. Self dilatation by the patient may also be used. In cases in which the bougie cannot be passed the use of the swallowed thread as a guide may be tried. A bougie must never be passed blindly under general anesthesia. Most of the patients are probably permanently cured by persistent treatment along these lines but there is a residue of cases in which the tendency toward recurrence persists for many years and possibly throughout life.

Gastrostomy is recommended in some cases of non malignant esophageal stricture to provide physiological rest this permits subsidence of the local inflammation and edema preliminary to the passage of the bougies. Gastrostomy is also an essential preliminary to plastic operations involving incisions into the lumen of the esophagus.

Direct surgical attack on the structural area is beset with many technical difficulties. The author believes that more and more effort should be expended in attempts to restore the natural esophageal pathway rather than to remedy the disability by surgical procedures which are dangerous and difficult.

SAMUEL H. KLEIN, M.D.

#### Chamberlin, D. T. Peptic Ulcer of the Esophagus. *Am J Digest Dis* 1939 5 725

In order to clarify the diagnosis of peptic ulcer of the esophagus certain diagnostic criteria are presented in addition to an etiological factor which according to Chamberlin has previously been overlooked.

These criteria are

- 1 The ulcer must not be associated with systemic disease. This stipulation is made because of the tendency to call any ulceration of the esophagus a "peptic ulcer" even in the presence of diabetes and

tuberculosis The implication is not made that systemic disease affords an immunity to peptic ulcer, but in certain diseases ulceration of the mucous membranes is more than likely to be the result of the disease rather than a separate entity

2 The ulcer must be seen at esophagoscopy or at autopsy

3 Free hydrochloric acid must be present

4 The ulcer must be chronic

5 The symptoms must be relieved by peptic ulcer therapy and dilatation

In the 7 cases described the additional etiological factor found in 6 was either a short esophagus, a diaphragmatic hernia, or both All of the 7 patients did well on Sippy management without local treatment except dilatation with 1 exception This patient required phrenicectomy before relief was obtained

SAMUEL J FOGELSON M D

Hillemand P and Garcia Caldéron J Roentgenological Characteristics of Cancer of the Esophagus (Caractères radiologiques du cancer de l'œsophage) *Ann méd chir Par* 1938 3 325

The roentgenological diagnosis of esophageal cancer by means of a contrast medium is not a simple problem if the lesion be an early one The authors have worked out a technique with barium sulfate in liquid cream and thick paste form With the patient standing lying horizontally or in the Trendelenburg position fluoroscopic studies are made and films taken in the anteroposterior, oblique, and lateral positions Several reproductions of x ray studies of some of their cases attest the precision and success of their technique

Cancer of the thoracic portion of the esophagus is found usually in the middle third An early lesion

there will cause functional disturbances, such as atony (which is shown by slow passage of the barium and filling of the piriform sinuses) and spasm, the obstructive signs of which usually first send the patient to the physician Morphological abnormalities such as a segmental rigidity of the esophageal walls, a slight retraction of the walls in silhouette, and changes from the normal in general contour all may lead to a suspicion of a locus of cancer However in the early stages these signs are of but little aid in the differential diagnosis of inflammatory lesions benign tumors, 'esophagitis,' or varices The important point is that regardless of their cause and nature, these changes have been discovered, and further, more conclusive study can then be made Cancer of the middle third in the full blown state shows the ragged, irregular shadow with large defects and lacunae which are unmistakable

Early cancer of the pharyngeal orifice of the esophagus may cause points of retraction of the wall laryngeal pressure barium filling of the periglottal folds, and, very often, reflux of the liquid toward the nasopharynx or larynx

If the lesion be seated at the cardia careful distinction from cardiospasm must be made There will usually be a ballooning of the esophagus above the lesion and a slow, irregular non rhythmic trickle of the fluid into the stomach A beginning cancer at the cardia has as one of its first signs a disturbance in the function of the sphincter

This paper is written not so much with the idea of teaching the diagnosis of esophageal cancer as of emphasizing the need of early discovery of functional and anatomical changes which will indicate the use of endoscopy as a conclusive procedure

JOHN MARTIN M D

# FACTORS IN THE PROGNOSIS AND MORTALITY OF GALL-BLADDER DISEASE

## Collective Review

WARREN H. COLE, M.D., F.A.C.S., Chicago, Illinois

**A**N analysis of the factors involved in the prognosis and mortality of gall bladder disease reveals the fact that numerous features of cholecystitis must be considered. Much of the data will be complicated and difficult to analyze particularly when one attempts to summarize it or draw conclusions. A great part of the difficulty in arriving at a summation of experiences from a series of reports is dependent upon the fact that any series except a very large one presents the danger of inaccuracies because of coincidence. Perhaps equally important is the fact that variation in incidence of certain diseases or their complications may be encountered because of the geographical effect on that particular disease even though a large series of cases is studied in each report. This is perhaps exemplified best as will be discussed later by the extreme variation in the incidence of carcinoma of the gall bladder associated with gall stones as reported from various clinics.

### INCIDENCE

It is agreed by all that gall bladder disease is one of the most common diseases with which the medical profession has to cope but it is likewise well known that it is affected very favorably by adequate therapy and the mortality is quite low. In an analysis of patients coming to a large western clinic Blackford (3) noted that 6 per cent presented complaints which were diagnosed as being produced by gall bladder disease. This is by no means an accurate estimation of the frequency of cholecystopathy since it is a well known fact that chronic cholecystitis with or without stones may exist without the patient's knowledge. Of 61 routine cases which came to autopsy at the Mayo Clinic Mentzer (23) noted that 62 per cent of the entire series and 66 per cent of all in which the patients were more than twenty one years of age showed gross evidence of gall bladder disease. However, he noted that cholesterosis which was found in about 38 per cent of the entire series occurred alone in 21 per cent of the series.

Since there is a growing doubt as to the pathogenicity of cholesterosis of the gall bladder this large group of 21 per cent would be considered by many authorities as not being comparable from the significance of disease, to the other 41 per cent showing gall bladder pathology. Mentzer noted that gall stones were encountered in 20 per cent of all patients or in 21 per cent of all patients past the age of twenty one.

In 1,000 routine autopsies in Vienna Crump (8) found an incidence of gall bladder disease of 59.6 per cent and in an additional 16.5 per cent of the cases cholesterosis was present alone. Gall stones were found in 32.5 per cent of the cases, a figure still higher than Mentzer's. Mosher (24) (Baltimore) found stones in 8 per cent of a series of 1,423 autopsies of patients past the age of twenty one; the incidence of stones in white people was 9.0 per cent and in the colored race 6.3 per cent. Stewart (27) found gall stones in 16.4 per cent of a series of 6,283 autopsies of patients past the age of forty. It would appear safe therefore to assume that at least 15 per cent of all people past the age of forty have gall stones and that probably an additional 15 per cent have cholecystitis without stones (disregarding cholesterosis) but that probably less than 20 per cent of the entire group having pathological lesions will present symptoms which can be diagnosed clinically as cholecystic in origin.

It is a well known fact that cholecystic disease is much more common in women than in men. A summary of statistics from reports reviewed indicates that the ratio is fully as high as 3 to 1. In a series of 200 patients studied at our clinic at the Illinois Research Hospital the ratio of women to men was still higher, being approximately 9 to 1. This obvious inconsistency is mentioned to illustrate how misleading certain statistics may be. In this instance the explanation lies not so much perhaps in the small series as in the fact that during this period the applicants for admission exceeded the facilities for hospitalization. Patients with the most serious complaints were admitted. This statement implies that women are more apt to be afflicted with serious

From the Department of Surgery, University of Illinois College of Medicine and the Illinois Research and Educational Hospital.

symptoms and complications than men, an observation which has in reality been made by numerous authorities. For example, the incidence of stones in the common duct as encountered at operation is much higher in women than in men, being 19 per cent and 12 per cent, respectively, in our series. This incidence which averages 18 per cent, is perhaps 1 or 2 per cent lower than the incidence reported by Lahey. To prevent the overlooking of stones in the common duct, this duct should be opened in all instances in which it is dilated or its walls are thickened, in patients who are jaundiced and in most patients who give a definite past history of jaundice. The incidence of cholelithiasis in patients operated on for gall bladder disease will average about 50 per cent in most clinics (Heyd (18), 59 per cent, Deaver (9), 50 per cent). The disease is much less common in the Negro than in the white race.

The incidence of carcinoma of the gall bladder appears to vary considerably, and depends largely upon the source from which the statistics are drawn. Next to the immediate operative mortality following cholecystectomy for cholecystitis, the death rate incident to carcinoma of the gall bladder is probably of more significance from the standpoint of life insurance than any other disease affecting the gall bladder. Carcinoma of the gall bladder is an extremely malignant tumor, the five year survival rate including the operative as well as the non operative cases being considerably less than 10 per cent. The most important features of carcinoma of the gall bladder, particularly in regard to life insurance, are related, therefore to its incidence. After a rather extensive study Rolleston and McNee (25) found that the incidence of carcinoma of the gall bladder in cholelithiasis varied between 4 and 15 per cent. The figures given in Table 1 represent those found in 11 consecutive reports encountered in a survey of the incidence of carcinoma of the gall bladder. The variation of incidence from 0.6 to 13.4 per cent is so extreme that it would appear hopeless and inaccurate to attempt to arrive at an average figure from this group of reports. When a percentage is given, specifications should be made as to the source of the cases studied, i.e., whether they were taken from autopsy or operative records, because the incidence should be lower in a group of patients who are operated upon than in a group of autopsy cases since the patients in the latter group will be older. The low incidence of 2 per cent reported by Judd and Gray (19) may in part be explained on this basis, since their figures are taken from operative cases. This is even lower than that of

other reports dealing only with operative figures. There may be an additional factor of considerable

TABLE 1—INCIDENCE OF CARCINOMA OF THE GALL BLADDER IN CHOLELITHIASIS

Author	No of cases of cholelithiasis	No of cases associated with carcinoma	Incidence of carcinoma (per cent)
Lentze	557	25	4.3
Heyd	330	13	4.0
Deaver and Bortz	450	13	2.9
Schroeder	141	20	13.4
Graham	564	48	8.5
Fawcett and Rippmann	592	48	8.1
Riedel	300	13	4.3
Slade	27	10	39.0
Candler	375	2	0.6
Judd and Gray	15,422	313	2.0
Illinois Research Hospital, Chicago	206	11	5.4

importance, namely, the fact that jaundice and weakness develop insidiously without much pain in carcinoma of the gall bladder and when the patients are seen by physicians they appear too ill to travel as far as the Rochester Clinic which derives its patients largely from out of town. It scarcely appears possible to assume that the hereditary characteristics of cancer are strong enough to explain a high incidence of carcinoma of an organ in one locality and a low incidence in another, although there can be no doubt regarding the existence of "cancer families." Judd and Gray reported that of 312 cases of carcinoma of the gall bladder and bile ducts, 32 per cent occurred in the ducts.

The relationship of gall stones to the development of carcinoma of the gall bladder has long been known. The incidence of stones in carcinoma of the gall bladder varies between 69 (Stewart, 27) and 100 per cent (Mentzer, 23). An average of 8 large series revealed an incidence of 85 per cent.

Considering the data presented, it is obvious that the incidence of carcinoma of the gall bladder in cholelithiasis is significant, and that the high incidence (85 per cent) of stones in carcinoma of the gall bladder is an important factor in its etiology. Graham (15) and others have called attention to the fact that cholecystectomy in the presence of cholelithiasis undoubtedly saves the lives of many people who otherwise would die from carcinoma of the gall bladder. It is true, however, as noted in Table 1, that the relationship

of carcinoma of the gall bladder to cholelithiasis is extremely variable. Undoubtedly the percent age would be much smaller if the survey were to include cases of cholelithiasis not confined to the hospital. Patients coming to operation for cholelithiasis would doubtlessly be older than the patients with cholelithiasis not confined to a hospital. Likewise persons with cholelithiasis coming to autopsy would be still older. In other words the danger of development of carcinoma of the gall bladder would in a general way increase with age and the length of time during which the individual has had the stones.

#### COMPLICATIONS OF CHOLECYSTITIS

The complications of cholecystitis are extremely numerous many of them are serious. They are of extreme importance because the deaths resulting from cholecystitis with or without operation are for the most part caused by the complications and not by the disease itself. Assuming that cholelithiasis is a part of the disease perhaps the most frequent complication is obstruction of the cystic or common duct by a stone. Usually obstruction of this type is temporary but not infrequently it is permanent and threatens life unless relieved. If the obstruction is in the cystic duct hydrops or empyema will result if in the common duct jaundice with its manifestations will result. Suppurative cholangitis with or without abscess formation is a frequent complication of common-duct obstruction and is usually fatal unless corrected early in its development by drainage of the common duct. Hepatitis is a frequent accompaniment of gall bladder disease (Graham) but fortunately is usually not serious.

Pancreatitis accompanies cholecystitis particularly cholelithiasis so commonly that it is considered a complication by most surgeons. Heyd (18) noted an incidence of pancreatitis (chiefly the acute edematous type) of 3.7 per cent in 557 gall bladder operations. During the past year or two while 87 cholecystectomies for cholecystitis were being performed at the Illinois Research Hospital 9 instances of acute pancreatitis (7 of the acute edematous type) were encountered. This constitutes an incidence of 10 per cent which is far too high and again illustrates how great an influence the factor of coincidence may be. It is accounted for in part by the fact that the patients admitted to the Illinois Research Hospital during this period were those complaining of the most severe symptoms but coincidence would appear to be a greater factor since in the eighteen month period preceding this interval

only 1 case was observed, and an interval of six months has elapsed since the last case was observed. The incidence of 3.7 per cent as noted by Heyd probably represents a fair average of the incidence of acute pancreatitis in gall bladder disease. The mortality of acute edematous pancreatitis is no greater than 10 per cent but the mortality of acute hemorrhagic pancreatitis is fully 50 per cent. Chronic pancreatitis as indicated by a thickening of the pancreas is diagnosed commonly at operation for gall bladder disease but autopsy statistics do not confirm its presence in a very high percentage of cases.

There has been a considerable difference of opinion as to the possibility of myocarditis being secondary to cholecystitis. It appears that occasionally there are instances when myocarditis is caused or aggravated by cholecystitis. Fitz Hugh and Wolferth (13) report 6 cases of cardiac disease improved by cholecystectomy.

Bailey (1) recently analyzed 200 gall bladder operations from the standpoint of complications and noted that complications which added seriously to the mortality of the operations required were present in 5 per cent of the cases. The incidence of serious complications is much higher in acute than in chronic cholecystitis. The serious complications of acute cholecystitis consist of perforation of the gall bladder, gangrene of the gall bladder, abscess formation, empyema and suppurative cholangitis. Further details of the relationship of acute cholecystitis to mortality and prognosis are considered later.

#### THE RELATIONSHIP OF THE TYPE OF INFECTION AND THERAPEUTIC PROCEDURE TO THE RESULTS

About 8 per cent of all cases of cholecystitis encountered in hospitals are acute and present symptoms which will readily differentiate them from chronic cholecystitis. Obviously it is important whether the cholecystitis is acute or chronic chiefly because the mortality will be greater in the former than in the latter type. The chief reason for the increased mortality rate in acute cholecystitis lies in the fact that complications are much more apt to develop in the acute cases. Many of these complications including particularly empyema, perforation, gangrene and suppurative cholangitis demand operative correction and are associated with a high mortality. The incidence of these complications varies considerably in different clinics. Judd and Phillips (20) encountered gangrene with perforation in 13.4 per cent of 508 cases of acute cholecystitis. Zimninger (28) encountered gangrene with perforation in 20.5 per cent of 78 cases of acute

cholecystitis In the author's experience, the incidence of perforation has been lower than either of the two mentioned above

A survey of the literature made by Heuer (17), showing a mortality of 6.6 per cent in 36,623 patients operated on for various types of gall bladder disease (chiefly chronic), and a mortality of 8.7 per cent in 1,066 cases of acute cholecystitis, illustrates the difference in mortality of the acute and chronic cases. More important, however, is the fact that in 502 cases of gangrene of the gall bladder with perforation the mortality was 46 per cent. The high mortality with perforation of the gall bladder has led many surgeons (Zininger, Heuer, and others) to recommend early operation in acute cholecystitis. The advantages claimed for immediate operation (cholecystectomy in most instances) in acute cholecystitis lie in the fact that during the first twenty-four or thirty-six hours the inflammatory changes in the gall bladder are so slight that cholecystectomy can be performed quite easily and without significant shock to the patient. However, surgeons recommending immediate operation for acute cholecystitis emphasize the fact that if the patient is not seen within from twenty-four to thirty-six hours following the attack it will probably be wiser to postpone the operation several days, since the inflammatory process including increased vascularity, thickening, and edema of the gall bladder wall will have progressed so far that postponement for several days will be the safer procedure. Utilizing this rule as to operability, the mortality rate reported by the various surgeons resorting to early operation (usually cholecystectomy) for acute cholecystitis is very little if any greater than the mortality following cholecystectomy for chronic cholecystitis. However, as stated previously, there is no agreement regarding operation in acute cholecystitis. For example, Cave (5) favors delayed operation in most cases and remarks that the "majority of surgeons are obtaining better results by waiting from one to five days before operating upon patients suffering from acute cholecystitis." Obviously the abdominal signs might be so suggestive of peritonitis that operation would be indicated immediately, i.e., as soon after admission as dehydration could be corrected. Most surgeons who favor delayed operation resort to immediate operation if the fever remains prominent longer than two or three days and the manifestations of peritoneal irritation, such as tenderness and rigidity, increase in severity.

In the author's opinion, adherence to this rule in the conservative treatment of acute cholecysti-

tis will lower the mortality rate very sharply and to a great extent will minimize the value of the principle of emergency operation for all cases of acute cholecystitis.

Although two or three decades ago cholecystostomy was perhaps preferred to cholecystectomy in the treatment of cholecystitis, practically all surgeons now agree that cholecystectomy is the procedure of choice, except in certain cases of acute cholecystitis, and in patients who are poor operative risks because of age, etc. The reason for the shift toward cholecystectomy lies in the fact that such a large percentage of patients upon whom cholecystostomy has been performed return with the recurrence of symptoms and require a second operation. For example, Black (2) noted that in his series of cholecystectomies only 1.8 per cent of his patients required an additional operation for disease of the biliary tract, whereas 24 per cent upon whom cholecystostomy had been performed required an additional operation. In 241 cases of cholecystectomy followed up by Cave (6) 86 per cent of the patients were well, in 32 patients upon whom cholecystostomy had been performed 56 per cent were operated upon a second time for persistent or recurrent symptoms referable to the biliary tract. The second operation naturally adds appreciably to the mortality, since the mortality from a secondary operation of this type (cholecystectomy in the presence of adhesions) will be higher than in an uncomplicated primary gall bladder operation.

#### OPERATIVE AND NON OPERATIVE RESULTS IN CHOLECYSTITIS, EXCLUSIVE OF MORTALITY

For a great many years there has been a minority of opinion that surgical treatment is much more effective than medical treatment, but the operative mortality and the more than occasional persistence of symptoms following operation for gall bladder disease remain as serious defects in surgical therapy. It is somewhat difficult to compare the results of medical and operative therapy, chiefly because very few studies have ever been made of the results of medical or non operative therapy. The report by Blackford (3) represents one of the few available. He followed up 200 patients with cholecystitis who were not operated upon. After an interval of ten years 15 per cent were dead (at an average age of sixty-five years), but only 1 per cent died as a direct result of the gall bladder disease. The others died from diseases such as myocarditis, nephritis, and cancer. Of the total group of 200 patients, 37 per cent were relieved or sufficiently well to be satisfied. Forty-eight per cent had poor results, inasmuch

as 21 per cent had come to operation later and 27 per cent were having so many symptoms that operation seemed definitely to be advisable. Blackford noted further that surgical emergencies arose only in 1 per cent of all cases of uncomplicated cholecystitis during the ten year follow up which indicates that delay in uncomplicated cases may not be very serious.

From an analysis of the above data and other experiences it becomes obvious that the benefits to be derived from operation in cholecystitis lie chiefly in the relief of symptoms and not in its life saving features. Since operation is not primarily a life saving principle it is perhaps appropriate to ask ourselves if cholecystectomy is harmful in any other way besides mortality. Like wise can the human being tolerate the absence of his gall bladder? The consensus of opinion is that the loss of the gall bladder the functions of which are primarily to concentrate and store bile, results in no harm primarily because in most instances its functions are usually destroyed by the disease before the operation is performed. We do know however that cholecystectomy results in a dilatation of the bile ducts (Counsellor and McIndoe) and a loss in tone of the common duct sphincter (Puestow). These changes however have not been considered detrimental. Although Cass and Whaley (11) contend that cholecystectomy results in a greater susceptibility on the part of the bile ducts to become infected a greater tendency toward intestinal putrefaction and a disturbance in the digestion of fat relief follows the operation in such a dramatic way that most authorities consider the pathological changes as being of little consequence. The above features represent practically the total of the evidence against cholecystectomy and it is not very weighty.

The greatest source of the misfortunes following surgical treatment outside of mortality lies primarily in the frequency with which an error in diagnosis is made. Perhaps a more frequent cause of unfavorable results lies in the fact that the patient may have cholecystographic and pathological evidence of cholecystitis but may be suffering from another disease such as arthritis of the spine, spastic colitis, carcinoma of the colon and pancreatitis which in reality is producing the symptoms. In such an instance we should not condemn the procedure of cholecystectomy but rather the diagnosis.

#### MORTALITY

The mortality following operations for gall bladder disease in various clinics is extremely

variable partially because of coincidence alone but especially because of the type of patients from which the figures are drawn. In other words did the patients have uncomplicated cholecystectomies or did complicating lesions such as suppurative cholangitis and inoperable carcinoma of the gall bladder, accompany the gall bladder disease? The analysis of a series reported by Heyd (18) illustrates this point decisively. In so far as the mortality of 557 operations on the biliary tract (with various complications) was 7.0 per cent, but only 3.3 per cent in 500 non complicated cholecystectomies. Heyd noted further that the mortality of all types of gall bladder disease in 477 private cases was only 4.8 per cent but in 140 charity patients it was 13.5 per cent. The mortality in choledochostomy for stones in the common duct will naturally be higher than the mortality of uncomplicated cholecystectomy as is illustrated by the figure of 8.7 per cent reported by Eliason and Erb (12) and 12 per cent by Mathews (22). After reviewing the results of various surgeons I would estimate the mortality in common duct surgery throughout the country not to be much lower than 10 per cent. As stated previously in a survey of numerous reports in the literature Heuer (17) found a mortality of 8 per cent in 1,066 cases of acute cholecystitis while in 50 cases of gangrene with perforation of the gall bladder there was a mortality of 46 per cent. In his survey of 35,623 operations for gall bladder and biliary duct disease he found an average mortality of 6.6 per cent. This probably represents a fairly accurate estimation of mortality when all types of patients and operations are considered.

From the above data it can readily be discerned that the mortality following gall bladder operations varies considerably and depends upon numerous factors one of the most important of which is the operability of the patient. Cholecystectomy for gall bladder disease in the absence of complications in the author's experience is not associated with a mortality greater than 1 or 2 per cent. On the other hand in elderly patients with myocardial or renal damage the expected mortality may be as high as 25 per cent. The age of the patient is no doubt an important factor in mortality. For example Goldish and Gillespie (14) noted that in a series studied by them the average age of patients dying following gall bladder operations was ten and three tenths years more than the average age of the patients who survived the operation. Obviously cholecystectomy should not be performed promiscuously on patients who are poor risks but not infrequently

symptoms are so severe as to demand an operative procedure of some type. In this group of patients cholecystostomy will be much safer than cholecystectomy and may afford relief for the few years of life remaining. Although the mortality following cholecystostomy, as practiced during recent years (14 per cent in a recent series reported by Heyd), is even higher than that following cholecystectomy, the explanation can readily be found in the fact that cholecystostomy now is being performed only on the patients who are seriously ill. Even simple procedures will therefore be associated with a high mortality.

Obviously, if extreme care is exercised in estimating the operability, choosing the right time for operation, treating patients pre-operatively, and performing the type of operation most suitable for the patient, the mortality will be lowered. For example, over a three year period Graham (16) was able to reduce his mortality in cholecystectomies from 6.0 per cent to 0.4 per cent by utilizing the precautions mentioned above and paying particular attention to the liver function test as a means of computation of operability.

For some unexplainable reason, women tolerate gall bladder operations much better than men. Almost invariably, in a large series, the operative mortality will be from 2 to 3 per cent higher in men than women. The mortality is usually higher in Negroes than in white people. In a series studied by Boyce and associates (4) it was found that the incidence of gall bladder disease in Negroes was only one fifth as great as that in white patients, but the mortality was higher, being 13.6 per cent, this was approximately 5 per cent higher than the mortality in the white patients of their series.

As intimated previously in this report, the question has been raised by many authorities as to whether the life expectancy in a patient whose gall bladder has been removed is not shortened.

This question has been answered at least to some extent by Dublin and associates (10) in their analysis of a group of people insured in the Metropolitan Life Insurance Company. In the group who had had drainage of the gall bladder (cholecystostomy) the actual death rate was 155.7 per cent of the expected rate. The group which had drainage of the gall bladder for stones had a still higher death rate, namely, 214.9 per cent. In the group which was treated medically the death rate was 115.1 per cent of that expected. The lowest death rate, 95.9 per cent of the expected rate, occurred in the group of patients who had had their gall bladder removed. Although the life span in this group of people having

had cholecystectomy was greater than that for the average individual, the difference was so slight that factors, such as coincidence, might explain the observation. In consideration of all the groups studied, the death rate was higher among the men than among the women. An analysis of the cause of death in the group in which the death rate was excessive revealed the remarkable fact that death was due, for the most part, to malignant or non-malignant diseases of the digestive tract. This is difficult to explain unless erroneous diagnoses and complications of gall bladder disease could be considered factors.

An analysis of the causes of death reveals the fact that the factors responsible for death are innumerable, but more important is the lamentable fact that peritonitis is the most frequent cause of death. Probably the most extensive study made is that reported by Stanton (26) who

TABLE II — CAUSE OF DEATH IN GALL BLADDER OPERATIONS

	Stanton (from lit.) per cent	Colp and Ginzburg (own cases) per cent	Heuer	
			(1,000 own cases) per cent	(56,523 cases from lit.) per cent
Peritonitis	15.4	16.5	37	33
Shock	5.0			
Pneumonia	10.6	9.3	25	20
Pulmonary Embolus	6.6	2.0		
Cardiac Failure	6.8	3.1	10	12
Renal Failure	4.8	3.1		
Operative Hemorrhage	6.4	3.1		
High Temperature	4.0			
Cholemia	4.4			
Cholemia with Hemorrhage	4.0			
Hepatic Insufficiency	3.8			4
Sepsis	3.2	3.1		
Emaciation	0.2	3.1		
Suppurative Cholangitis	4.0	14.4		
Pylephlebitis		8.2		
Pancreatitis		5.2		2
Injury or Stricture C. D.		9.3		
Gangrene and Perforation			11	10
Miscellaneous			17	19

analyzed 500 deaths following gall bladder operations. The percentage (15.4) of deaths caused by peritonitis approaches quite closely that (16.5) reported by Colp and Ginzburg (7). In each series



the percentage of deaths attributed to pneumonia is approximately 10 per cent

In a much smaller series Heyd (18) noted that approximately 20 per cent of the deaths were attributed to hepatic insufficiency. Although only 3.8 per cent of the cases studied by Stanton resulted in death due to hepatic insufficiency, it would appear that the major factor in many other groups such as cholema, cholema with hemorrhage, high temperature, renal failure and perhaps others may be attributable to hepatic insufficiency.

Contrary to what might be expected, the incidence of evisceration as a cause of death was surprisingly low, being 0 per cent in one series and 3.1 per cent in the other. Maes and his associates (17) have called attention to the fact that the high incidence of death in patients who have suffered evisceration is not attributable directly to the evisceration itself. In other words, post-mortem and clinical studies show quite clearly that death would have occurred anyway in the great majority of cases.

#### SUMMARY AND CONCLUSIONS

A statistical study of a disease as common as cholecystitis reveals the fact that variations are so great in many of the issues that an average would not appear to be accurate. However, figures regarding the incidence of cholecystitis (from the pathological standpoint) are fairly uniform. It appears safe to assume that about 15 per cent of all people past the age of forty have cholelithiasis and that an equal number have cholecystitis without stones (excluding cholesterosis which has doubtful clinical significance).

The incidence of carcinoma of the gall bladder in cholelithiasis (from 0.6 to 13.4 per cent) is so variable that the significance of a statistical average is questionable. In certain localities the incidence is high enough to be of distinct importance in determining prognosis and life expectancy. Whether huge variations are best explained on the basis of small series or because of geographical location is difficult to determine except that the latter undoubtedly is of greater importance than considered by most individuals.

There is still so much disagreement regarding the treatment of acute cholecystitis whether it should be conservative or operative that a decision on this point cannot be made. More accurate knowledge of the role of chemical versus

bacterial factors in the pathogenesis of acute cholecystitis would undoubtedly help solve this problem.

The mortality of operations upon the gall bladder as computed from numerous reports appears to be about 6.5 per cent. In this group the mortality of acute cholecystitis will be as high as 8 per cent and of uncomplicated chronic cholecystitis in private practice as low as 3 per cent (contrasted to charity patients in whom the mortality is much higher). The mortality of cholecystectomy throughout the country is probably no less than 10 per cent.

The most common causes of death in gall bladder surgery are peritonitis, pulmonary complications and hepatic insufficiency.

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# SURGERY OF THE ABDOMEN

## ABDOMINAL WALL AND PERITONEUM

Pitcher R The Repair of Hernia with Plantaris Tendon Grafts *Arch Surg*, 1939 38 16

The plantaris tendon is a suitable structure for grafting and can be used in operations usually performed with grafts of fascia lata, over which it has several advantages

It is absent in 75 per cent of subjects In a further proportion of cases it is too slender to be used as a graft in hernia repair, although it may be adequate for other purposes as a suture material This constitutes the sole disadvantage of the proposed use of the tendon The deficiency, however, is more common in women than in men and it is for the latter that the graft is mostly required for hernia repair Moreover the tendon is often palpable through the skin, and, although its absence cannot be inferred when it is impalpable, it is often possible to determine that it is present and well developed before an operation is begun

For the greater part of its course the tendon lies in loose areolar tissue this allows easy separation by blunt dissection but where it passes under the edge of the gastrocnemius muscle it may be held close between that muscle and the soleus tendon, and a little difficulty may be encountered in separating it from them

The tendon has the curious property of stretching laterally without splitting Even a slender specimen may be pulled out easily into a sheet 2 in wide A part of this lateral stretching occurs at the expense of the length, and if the stretched tendon is pulled lengthwise it resumes its cordlike form Use is made of this property in the method of repair of hernia described

An incision 1 in (2.5 cm) long is made over the medial aspect of the Achilles tendon a little above its lower end If the tendon is in its most common place it will be exposed by the incision and will be seen lying on the Achilles tendon If not present here it should be sought in the fat anteromedial to the tendon where it is easily identified if made taut by dorsiflexion of the foot Finally, it may sometimes be found closely applied to the anterior aspect



Fig 1 Plantaris tendon exposed at the lower end divided and threaded through the eye of the stripper

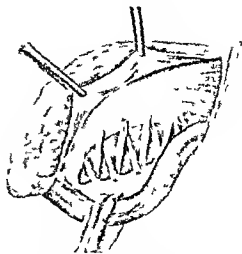


Fig 2 Graft stitched in position before spreading of the strands

of the Achilles tendon When found it is cleaned in the length of the wound and divided as low as possible The cut end is then passed through the eye of the stripper (Fig 1) which is the only special instrument required and is a modification of Mayo's varicose vein enucleator The eye of the stripper, threaded over the tendon, is then inserted in the wound and pushed up the leg while tension is maintained on the cut end Very little resistance is encountered to the passage of the stripper, but it may require a little coaxing about the middle of the tendon where it lies in the angle at the junction of the gastrocnemius and soleus tendons The stripper is pushed up until the eye lies just below the popliteal fossa A second incision 2 in long is now made over the medial edge of the tibia, near its upper end where it expands toward its head This

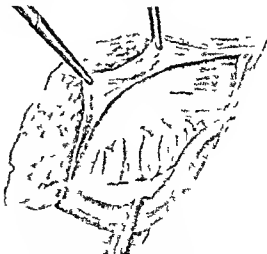


Fig 3 Adjacent strands of graft spread and sutured to one another

incision is carried through the deep fascia which is a forward extension of that enclosing the gastrocnemius muscle. The incision in the deep fascia opens the plane between the gastrocnemius and the soleus muscles. The muscles are separated by blunt dissection and held apart with the blades of a large artery forceps. The assistant by manipulating the handle of the stripper can direct its eye toward the surface of the wound the tendon at this level being deep because of its oblique course toward the lateral condyle of the femur. The tendon is easily identified in the eye of the stripper and is divided as high as possible. Tendon and stripper are then withdrawn through the lower incision and both incisions are closed. No vessels of any size need be divided by the incisions, the subcutaneous veins in the upper part being usually visible and easy to avoid. At first the upper incision was made on the eye of the stripper while the assistant directed it to the surface but this method was abandoned as it was feared the saphenous nerve might be injured. Because of the possibility of bleeding from the binding of vessels crossing the lower half of the tendon a crepe bandage is applied to the leg.

The tendon is used as a graft and not as a suture. It is hoped that the tendon will be less readily absorbed than fascia lata but as yet there is no evidence on this point. On the assumption however that absorption may occur the graft is fixed in position with unabsorbable sutures of thread or silk which acting as foreign bodies stimulate fibrous tissue which is permanent. Fibrosis stimulated by absorbable agents is not permanent as can be seen in the treatment of hernia by injection.

After the usual treatment of the sac the inguinal canal is prepared for the graft. In the case of direct hernia the defect in the transversalis fascia is closed with silk or thread. The inguinal ligament and conjoined tendon are cleared of areolar tissue. As far as possible the graft is fixed to aponeurotic rather than muscular structures and when the internal oblique is muscular it may be better to use the underlying transversalis aponeurosis. Rarely do the muscular fibers of the transversalis extend as low as the spermatic cord. The graft is fixed in a zigzag pattern being sutured alternately to the inguinal ligament and the conjoined tendon or one of its components with fine silk or thread (Fig. 2). Care must be taken that the medial angle is adequately covered. There is no tension on the graft and no attempt is made to approximate the conjoined tendon to the inguinal ligament. The outer end of the graft may be fixed in a loop around the internal ring. After the graft has been fixed in the zigzag fashion adjacent strands are sutured to one another the property of lateral stretching allowing this to be done without tension (Fig. 3). In this way the grid of tendon strips is converted into the equivalent of a continuous fascial sheet. The cord is replaced and the wound closed in layers.

The advantages claimed for the method are as follows. The structure used as a graft is removed

with very little trauma and its removal causes no disability. Being tendinous the graft is probably less easily absorbed than fascia. The graft is inserted with minimal trauma to the structures between which it acts as a bridge. It is fixed without tension with unabsorbable sutures thus excites fibrosis which persists even if the graft is absorbed. Lateral stretching of the graft makes approximation of adjacent strands possible without tension.

SAMUEL KARN M.D.

Leibovici R and Yovanovitch B Y. Encapsulating Peritonitis. Etiology, Diagnosis and Treatment (Quelques remarques sur la péritonite encapsulante. Étiologie, diagnostic et traitement). *Rev. de chir.* Par 1938 57 734.

In 1931 Wilmoth and Yatel drew attention to a special form of chronic plastic peritonitis characterized by the encystment of a portion of the intestine in a fibrous sac and called encapsulating peritonitis. This was no new entity it had been described previously by several German surgeons. Leibovici and Yovanovitch have had occasion to review a series of 6 such cases as well as to have personal experience in the diagnosis and treatment of 6 cases. Their ideas relative to etiology, diagnosis and treatment do not slavishly follow the prescribed rules rather they have formed certain new concepts which would appear to be well grounded.

In spite of all the minute details of anatomical characteristics and variation described for this lesion the authors believe that its sole reliable characteristic is the presence of an encapsulated mass containing all or a part of the intestine. The exact fibrous or serous reddish or blanched tough or delicate nature or its adherent or loose fixation to the parietal peritoneum are not held by the authors to be important factors.

Various theories have been propounded concerning the cause of these lesions. Gastric hypochlorhydria, congenital malformation, a constitutional tendency toward fibrous tissue formation, previous operative trauma, accidental trauma, colitis, chronic appendicitis, adnexal disease, internal hernia, acute peritonitis and syphilis have all been proposed as the etiological basis for encapsulating peritonitis. However the authors are satisfied in their own minds that the actual cause in all proved cases is tuberculosis. In this belief they will no doubt find considerable support from other present day surgeons.

They find peritoneal or pulmonary tuberculosis existing in almost every case of encapsulating peritonitis. The diagnosis need not be considered as too complex a task. In a patient who has had ascites or other tuberculous pleuropulmonary antecedents who has in the recent past shown signs of subtotal intestinal occlusion and who upon examination presents a soft or flabby palpable mass encapsulating peritonitis of tuberculous origin must be considered first of all.

The authors are inclined to be conservative in their treatment. They prefer not to attempt removal of the mass unless it is 'cold' or in a state of chronic quiescence. In such a case if a bowel obstruction is present or threatening they may attempt careful dissection with freeing of the bowel, followed by irradiation of the opened peritoneal cavity. In any other case treatment is limited to irradiation especially if there is any reason to believe that the mass is actively inflammatory. With this 'hands off' policy, their results have been good.

JOHN MARTIN M D

### GASTRO INTESTINAL TRACT

Dobbs R H The Treatment of Pyloric Stenosis with Eumydrin *Lancet* 1939 236 12

Twenty cases of pyloric stenosis in infants were treated with eumydrin (atropine methylmurate). The drug was prepared in a solution of 1 to 10,000 and the dosage was 1 c cm which was increased to from 4 to 6 c cm and given twenty minutes before feeding. Dehydration and alkalosis were combated by the usual injections of normal saline solution and food was withheld for from twelve to eighteen hours at the onset of the treatment. Breast milk was preferred the feedings began with 8 c cm every two hours and increased to normal feedings after three or four days. Before the treatment, gastric lavage was carried out daily until there was no evidence of gastric retention. The drug was usually continued over a period of from six to twelve weeks. In only 1 infant receiving 8 c cm before each feeding was there a development of symptoms similar to atropine poisoning. Sixteen of the 20 patients were cured by this treatment. Three patients were operated upon successfully after administration of the drug had failed to relieve the vomiting and 1 patient died while undergoing medical treatment.

ROBERT ZOLLINGER M D

Loewy G Five Cases of Gastrojejunocolic Fistula The Two Stage Operation. The Surgical Technique (A propos de 5 observations de fistules gastrojejunocoliques. Operation en deux temps. Technique chirurgicale) *J de chir* 1939 33 30

As many surgeons know a gastrojejunocolic fistula may be the unfortunate sequence to a gastroenterostomy performed with or without pylorotomy or other additional surgical procedures in the treatment of peptic ulcer. The complexity of such a fistula, the fecal contamination of the stomach and jejunum, the stenosis of the large bowel and the weakened condition of the patient all are factors which combine to make surgical correction one of the most redoubtable operations in all surgery. Loewy has had occasion to operate upon 5 patients with such a lesion during the past five years.

The author believes that except in rare cases the surgeon should prepare the patient for two separate operations. First just as soon as there is clinical evidence of the existence of such a fistula, a careful and

painstaking dissection of the fistula must be made, with excision of its openings into the stomach, jejunum, and colon, followed by careful closure of these openings. Then every supportive care should be given to the patient for at least four weeks before the final operation is to be attempted. This consists of partial or subtotal removal of the stomach with a fresh gastrojejunostomy in a now clean uncontaminated field, for the cure of the original lesion, the peptic ulcer. To repair the fistula and perform a gastrectomy all in one stage is courting disaster and it must not be considered unless one's hand is forced.

Loewy uses a combination of spinal anesthesia and sympathetic block. He warns especially against damage to the blood vessels in the dissection of the fistula and regards this first operation as the one requiring the greatest amount of skill, precision and methodical treatment. Most patients surviving the repair of the fistula from twenty four to forty eight hours withstand the subsequent gastrectomy well and once safely through the first operation they may be expected to attain eventual cure.

JOHN MARTIN M D

Stoiz W Gastric Phlegmon (Ueber die Magenphlegmone) *Arch f klin Chir*, 1919 102 134

The author gives a good picture of the present day conception of gastric phlegmon.

Gastric phlegmon is very rare. Three hundred and one cases have been reported of which 105 have been collected by the author since the compilation of Finsterer ten years ago. This includes the 84 cases described by Melander.

The author groups these phlegmons according to the classification of Stundberg as follows: (1) the gastric phlegmon which is either diffuse or circumscribed; (2) the gastric abscess; (3) the mixed forms: (a) with one or more abscesses and (b) with more or less phlegmon.

The pathology is usually first limited to the submucosa from which the muscularis is invaded and seldom involves the mucous membrane. Following perforation into the gastric lumen the abscess may drain from below the submucosa. The extent of the process can be determined only histologically even though macroscopically the transition from pathological to normal is very noticeable. A chronic case of phlegmon may proceed to linitis. Streptococci were found in 79 per cent, pneumococci in 4 per cent and Fraenkel-Welch bacilli in 1 per cent.

The primary idiopathic disease is believed to be caused by other factors, however. The earlier belief that poor hygienic factors (alcoholism) caused the condition is not correct. Racial characteristics may have some bearing; the condition is found very frequently in the Ukraine. Men are affected more often than women. The patients were most often between the third and sixth decades of life. There are two forms of gastric phlegmon: (1) the acute with fever and general symptoms predominating and (2) the subacute or chronic form usually without

fever. The symptoms are usually referred to the upper abdomen. Pre operative diagnosis was possible in only 2 of the 66 cases seen in the last ten years. Two cases have been reported in which such a pre operative diagnosis was made roentgenologically (Rothermel and Olsson).

The prognosis is bad. Sundberg reports a mortality of 92 per cent. In the author's 105 cases the mortality was 70 per cent. The prognosis is best in the chronic localized cases. The more severe the peritonitis accompanying the condition the poorer the prognosis.

The treatment is essentially surgical. Of 30 patients treated by gastric resection 21 survived, all of this group presented the subacute chronic localized type of phlegmon. Only 1 patient with diffuse gastric phlegmon (reported by Melander) who underwent exploratory laparotomy, and was treated with antistreptococic serum and drainage and an additional patient (case reported by von Paugger) also undergoing laparotomy and treated by omental covering of the necrotic gastric wall plus drainage of the peritoneal cavity have recovered. However resection is not always the operation of choice; the surgeon must rely entirely upon the findings in each specific case. At present treatment with protosol should be considered. The author reports 2 cases of his own. Both patients died, one after operation the other after exploratory laparotomy.

(FRANZ) SAMUEL J. FOGELSON M.D.

**Salaris C. Benign Tumors of the Stomach and Duodenum. A Clinical and Anatomicopathological Contribution** (I tumori benigni dello stomaco e del duodeno. Contributo clinico e anatomo patologico). *Arch ital di mal dell'appar di gerente* 1938 7 499.

Benign tumors of the stomach may belong to various histological types according to the tissue from which they originate, the most common are the adenomas and myomas and the rarest the lipomas and tumors of vascular type. They are sessile or pedunculated being called polyps in the latter case. Benign tumors of the duodenum occur only rarely as isolated formations but more frequently as duodenal polyposis associated with gastric and rectal polyposis they are usually of adenomatous or connective tissue type and are nearly always found in the first part of the duodenum.

The relative frequency of these benign tumors amounts to 6.9 per thousand of that of the malignant tumors. The clinical symptomatology is very indefinite but the roentgenologist usually succeeds in solving various difficulties arising in the interpretation of a gastric tumor by the use of the current technical refinements. Generally the form of the stomach is preserved its walls appear normal and active and passive movements are not altered, this also excludes infiltration of the ligaments and mesentery. However in tumors with intraparietal development suspicion of a filling defect of cancerous or inflammatory type may arise at first sight but careful

examination will show that the lacuna is well rounded with distinct borders similar to that found in compression by extrinsic organs. Changes in the position of the patient allow differential study. These roentgenological findings apply also to benign tumors of the duodenum but examination of the first portion of the duodenum is easier than that of the other two portions. A lacunar defect in the bulb calls for further study and possible sources of error such as the presence of foreign bodies and bulbar ulcer with hypertrophic and distinct margins must be kept in mind.

The complications of benign tumors are hemorrhage leading gradually to anemia especially of hyperchromic type with marked hypochlorhydria and even complete achlorhydria, occlusion of the pylorus by a pedunculated tumor, gastroduodenal invagination and the possibility of malignant degeneration. The association of malignant and benign tumors in the stomach has been reported. A purely clinical diagnosis of benign tumor is nearly impossible; the prognosis must necessarily be reserved and treatment in case of certain or probable diagnosis must be surgical.

Salaris describes several cases of benign tumor of the stomach and of the duodenum. Correct clinical diagnosis was made in 4 while a malignant tumor was believed present in 1 and hemorrhage from duodenal ulcer was diagnosed in 1. The 3 diagnostic errors were due to the impossibility of making the necessary complete investigation of the patients on account of the gravity of their condition on admission. In 1 of the correctly diagnosed cases duodenal polyposis had escaped observation because of the preponderance of the gastric symptoms and was discovered at necropsy. The 4 correctly diagnosed cases included hypertrophic gastritis with polyp formation, gastric polyposis, polyp of the angulus and polyp of the duodenal bulb. In 2 of the 5 cases of benign gastric tumor there was complete gastric achylia with the blood findings of typical pernicious anemia demonstrated in the peripheral blood and in the sternal bone marrow; this association can hardly be fortuitous in view of the rarity of benign gastric tumors and the relative frequency of pernicious anemia.

RICHARD KEMEL M.D.

**Finsterer H. Malignant Degeneration of Gastric Ulcer.** *Proc Roy Soc Med Lond* 1939 32 183.

Malignant degeneration of a gastric ulcer is a much more serious complication than either acute perforation or acute profuse hemorrhage because it may not only end fatally from the surgical intervention but also through the frequent subsequent development of metastases after a radical operation. It is never possible to establish definitely how often a gastric ulcer undergoes malignant degeneration because this would require knowing in a given country the clinical picture of ulcer cancer and also following up all these patients for life. For this reason it is only possible to approximate the percentage of malignant changes in gastric lesions.

Post mortem examination is the least satisfactory method to establish the incidence of ulcer cancer because after the patient has died from an ulcer cancer the malignant growth usually has so completely overgrown the ulcer that it can no longer be recognized as ulcer cancer. However, should the patient die from another cause it would be possible to recognize from the post mortem specimens an accidental finding of ulcer cancer. Examination of the operative specimen is of much greater value in the recognition of early degeneration. The wide difference reported (5 to 50 per cent) may be explained by variation in the type of patients operated upon as well as variation in the thoroughness of histological study. The surgeon who refuses to operate upon acute flat ulcers, limiting his material to chronic ulcers of long standing and resecting all gastric ulcers even those near the pylorus and penetrating into the pancreas, which are often dismissed with only a gastro enterostomy will have a higher incidence of malignant degeneration than the one who operates on acute ulcer, or resects the small flat ulcers which rarely degenerate, and leaves the calloused lesions penetrating into the pancreas.

Histological examination requires an experienced pathologist because it is exceedingly difficult to differentiate early malignancy from the heterotypical epithelial proliferation at the edge of a healing ulcer. This requires years of experience. Again it is occasionally extremely difficult to find the area of malignant degeneration because this would require serial section examination of each ulcer. Moreover there are cases in which thorough examination failed to reveal cancer but the patient subsequently died from metastases in the liver although no gastric malignancy could be found at post mortem.

Konjetzny is quoted as maintaining that Finsterer's high percentage (24) of malignant degeneration is due to the fact that (1) ulcerated primary cancer was diagnosed as degenerated ulcer and (2) cases with atypical epithelial proliferation of a healing ulcer were diagnosed histologically as early cancer. In answer to this criticism Finsterer points out that his pathologists, Stoerk, Baur, Chirari, Maresch and Sternberg all competent gastric histologists have made the diagnoses in his material. Moreover the ultimate death of several of his patients with metastases in the liver have proved the accuracy of the diagnosis made by these pathologists.

The author has grouped his 141 personal cases of ulcer cancer into three groups. Group I consisted of 41 cases diagnosed clinically and at operation as ulcer, but which upon histological examination showed incipient cancer. Thirty five of the patients were operated upon before 1933 and 18 (51.4 per cent) have been symptom free for more than five years. Group II consisted of 55 clinically diagnosed cases of ulcer in which the diagnosis of ulcer cancer was made during the operation and subsequently confirmed histologically. Twenty seven of the patients were operated upon before 1933 and only 4 of these (14.8 per cent) are still symptom free. Group

III consisted of 45 cases diagnosed both clinically and macroscopically as ulcer cancer. Thirty seven of the patients were operated upon and only 2 (5.4 per cent) have been symptom free for the same period. In addition, Finsterer found that in his series of 537 resections for gastric ulcer the frequency of ulcer cancer was 20.9 per cent. In another series of 718 resections for gastric cancer the frequency of ulcer cancer was 19.6 per cent. Therefore, early surgery is justified in all these patients because the surgical mortality for gastric resection without attack upon the pancreas, liver, and colon in the 99 patients operated upon in Groups I, II, and III was 4 per cent.

SAMUEL J. FOGELSON M.D.

Grauhan M. Age and Resection of Carcinoma of the Stomach (Alter und Resektion des Magenkrebses) *Ztschr. f. Altersforsch.* 1938: 49

During the course of eight years, from January 1, 1929, to December 31, 1936, 149 cases of carcinoma of the stomach which showed subsequent typical courses i.e. death occurred within two years were found by clinical and x-ray examination. The youngest patient was twenty six years and the oldest seventy two. Sixty four (43 per cent) had not yet reached the age of thirty. Ten per cent were more than seventy years old. More than half were between sixty and seventy years of age. An abrupt rise in the curve of incidence occurs at the forty fifth year. After this age is reached the radical operation can not be performed as frequently as before and the mortality for resection rises. As the outlook is absolutely hopeless when a resection cannot be done (81 per cent of the inoperable cases terminated fatally within one half year and only 3 of the patients survived more than one year) the operation frequently has to be done even if the prognosis is poor. Of the 54 patients who were less than fifty five years of age 75 per cent were operated upon while of the 95 patients more than fifty five years old only 45 per cent came to operation.

Grauhan had much more success in the cases of total resection in which the duodenum was joined with the esophagus than when he performed a subtotal operation after which all of the patients died. In 68 per cent of the patients who were less than fifty five years of age and came to operation, resection could be performed while only 54 per cent of those more than fifty five years old could be treated similarly. Thirty seven per cent of all patients who underwent resection died within the first four weeks after operation. The mortality among the 28 patients who were less than fifty five years of age was 25 per cent of the 63 upon whom resection was done after the fifty fifth year, 52 per cent died.

Unfortunately recurrences occurred after a longer time had elapsed. Grauhan refers to the case of a woman who was able to carry on her normal activities and was free from symptoms for a period of seven years after which time she developed a recurrence in the form of a large intraperitoneal tumor (BERGEMANN). JOHN A. GIUS M.D.

Dill L V and Isenhour C E Observations on the Incidence and Cause of Fever in Patients with Bleeding Peptic Ulcer *Am J Digest Dis* 1939 5 779

Despite their failure to determine the cause of fever in patients with bleeding peptic ulcer the assistants present in this study a combination of clinical and experimental investigations which should stimulate further research on this subject. No one to date has adequately explained the cause of fever following hemorrhage from ulcer. In general the presence of blood in the gastro intestinal tract has been considered the most significant causative factor.

From 1913 through 1936 there were 109 patients with proved peptic ulcer admitted to the Vanderbilt Hospital. They were classified in three groups. Group I consisted of 155 patients with peptic ulcer who stools showed no occult blood and who presented no history of recent bleeding. Group II consisted of the remaining 44 ulcer patients who stools gave strong reaction for occult blood and who for the most part had come into the hospital for complaints referable to hemorrhage. There was in addition a control group (Group III) which consisted of 75 patients in whom no organic disease of the gastro intestinal tract could be demonstrated and in whom the diagnosis of gastric neurosis was unquestionably made.

In this study fever was arbitrarily defined as any rise in temperature above 99 degrees F which persisted for more than two days or any rise to 99.2 degrees F or above for two days or any single rise exceeding 100 degrees F. One hundred and six of the 109 patients or 53 per cent had fever which satisfied the criteria established. Forty six per cent or 71 of the 155 patients with non bleeding ulcer had fever. Thirty five of the 44 patients with bleeding ulcer or 80 per cent were febrile. Fever was present also in 57 per cent of the patients with gastric neurosis. This observation would suggest that hemorrhage or blood in the gastro intestinal tract was a significant causative factor.

However the study was further supplemented with valuable experimental studies. In dogs bled approximately one fourth of their blood volume there was practically no elevation in temperature. In dogs bled one fourth of their blood volume and then fed this same blood by stomach tube there was no significant fever elevation. The study was there after supplemented by human experiment in which more than 500 c cm of human blood were given by stomach tube. None of these patients showed an elevation of temperature.

From this material the authors conclude that elevation in temperature occurs more frequently in patients with bleeding ulcer than in those with ulcer and no hemorrhage but their experimental work does not clarify the causative factors concerned. It does suggest however that blood in the gastro intestinal tract is not the sole causative factor.

SAMUEL J. FOGELSON, M.D.

St John F B Harvey H D Gius J A and Goodman E N A Study of the Results of Surgical Treatment of Peptic Ulcer *Ann Surg* 1939 109 193

In the year 1916 the surgical department of the Presbyterian Hospital New York organized a follow up clinic for the purpose of recording and studying the results of their surgical therapy in gastroduodenal ulcerative disease. From the data accumulated in the past twenty two years the essayists reached certain conclusions which they present.

First they learned that every case must be followed in continuity. In order to do this graph records were prepared to enable the examining physician to follow at a glance the course of the case. These charts which appear in the article are a most practical as well as efficient method of obtaining statistical data on patients with ulcer. In addition a standard for recording the follow up results was prepared. The results were evaluated from an anatomical symptomatic and economic standpoint. Symptomatic results were the only ones considered in the article.

Four main groups were subdivided as follows:

Groups 1 and 2 included cases in which the results were unsatisfactory. Groups 3 and 4 included cases in which satisfactory results were obtained. Group 3 included the cases of only those patients having no significant symptoms and in whom only the mild digestive disturbances to which normal man is heir may occur. Group 1 contained those cases in which the results were the least satisfactory of all. If at any time a given case presented unsatisfactory results it was permanently dropped from the groups with satisfactory results. By a critical appraisal of their follow up records it was hoped that it would be possible to establish with reasonable accuracy standards of guidance in the selection of cases for operation as well as in the choice of operation to be employed for individual cases. In addition the patients were catalogued according to the outstanding pre operative complaints such as obstruction, bleeding and pain with the appreciation that such a separation of cases into these three groups could never be wholly accurate.

From this study it was found in the obstruction group alone that partial gastrectomy gave no better results than gastro enterostomy and the death rate for the latter was lower. The Finney type of pyloroplasty gave the least desirable results in the cases of patients complaining of obstruction alone.

Seven of the 207 patients studied died of their ulcer at some time after leaving the hospital. In addition 2 died of pulmonary lesions and 20 died of miscellaneous other causes. Fatal gastrectomy of the Billroth and Joly types was found most successful for gastric ulcers as it gave satisfactory results in 92 per cent of the cases. It was found also that the duration of the observation period was most important and that a distressing number of initial recurrences of symptoms occurred many years after

operation'. Of the 29 patients who were free from symptoms for ten years after gastro enterostomy 5 had recurrences later, i. e., before fifteen years.

An attempt was made to analyze the causes of failure following those operations which were performed most frequently. In a total of 314 individuals, the condition of 118 became unsatisfactory sooner or later, temporarily at least. Recurring marginal or jejunal ulcers, demonstrated roentgenologically appeared in about one half the patients upon whom unsuccessful gastro enterostomy had been performed, as well as in one half of those who had undergone unsuccessful partial gastrectomy. Poorly functioning stomas appeared relatively more frequently among the patients upon whom gastro enterostomy had been performed.

An attempt was made to learn how often carcinoma developed in previously benign ulcers but a conclusion was not reached in this study. Of 88 patients with gastric ulcer, 3 died of carcinoma without recognition of the disease at the time the symptoms first developed. The good results that have followed partial resection for benign ulcers have encouraged resection more than ever in the cases of doubtful conditions which do not heal rapidly under medical care. The mortality rate in the cases of 133 patients who had undergone partial gastrectomy was 16.5 per cent. Death from duodenal ulcer occurred in 18.5 per cent of the cases and from gastric ulcer in 13 per cent of the cases.

Leakage in the suture line was found to have caused somewhere between 37.5 and 68.8 per cent of all deaths. Obstruction was of even greater importance because it was known to have occurred in 9 of 16 fatalities and may possibly have been present in 5 other cases. Obstruction was believed to be caused by the kinking or twisting occurring close to the site of the anastomosis in either the proximal or distal loop. Four of 6 leaking duodenal stomps were associated with, or probably partly caused by, such obstructions. A drain placed in the site of the stump almost as a routine measure should suffice for the leaking duodenal stump. Not one of the surgeons who operated in the 8 cases in which such leakage occurred thought his closure of the stump was in secure, otherwise drainage would have been instituted. Inasmuch as it is impossible to predict which stump will yield to the pressure caused by the unexpected obstruction which may or may not be temporary, drainage is recommended. The fistulas which have developed in this series have all closed spontaneously.

It was of interest to note that there was little preference between the anterior and posterior Polya technique, from a standpoint of postoperative mortality, or incidence of postoperative complications and follow up results.

The conclusion is drawn that until the cause of peptic ulcer is known, efforts should be directed, not toward more radical surgery as is the present trend, but rather toward selective surgery. This selection can be made only if follow up results are known and,

as surgeons, it is our responsibility to select the patient for the operation and the operation for the patient.

SAMUEL J. FOGELSON, M.D.

Yódice A. and Giordano A. Semilunar Ganglionectomy and Constipation (Semilunectomía y constipación) *Arch. argent. de enferm. d. apar. digest.* 1939 14 208

In a memorable work, Bayliss and Starling, in 1899 demonstrated that intestinal peristalsis consists of a wave of relaxation followed immediately by a second wave of contraction. This peristalsis is a universal phenomenon in all of the enteric tract, but the waves generally speaking are very frequent in the duodenum and infrequent in the colon. If all the waves which begin in the higher portion of the tract continued to the anus, the evacuation would be rhythmical and too frequent every two or three hours there would be elimination of a small quantity of feces. This however is not true in the normal organism in the latter the peristalsis diminishes gradually and reaches its minimum in the last portion of the colon. The delay transforms what would otherwise be a continuous passage of feces through the anus, to elimination once or twice daily.

It has been shown that the extrinsic innervation of the intestine brings the inhibitory stimulus and the section of some of these nerves cures or improves the constipation. The best demonstration was made by Trumble of Melbourne, Australia (Brit. J. Surg., Vol. 13) who sectioned the inferior splanchnic nerves in dogs and monkeys, with the immediate release of the intestinal contents and the appearance of powerful intestinal waves. The section of the splanchnic nerve in 2 patients with constipation brought the same effect but with some attenuation.

Further experiments with excitation of the pelvic nerve, sometimes with previous destruction of the brain or the medulla or with section of the splanchnic or the hypogastric nerve were registered at various heights of the bowel with enterographs.

Pieri divides the constipation into right or atonic, left or spastic. In the right constipation he resects the lumbar ganglions transparently. In this way he can resect the left and right chains in one sitting. He admits that in atonic constipation the results are not as good as in Hirschsprung's disease. In the latter he also resects the ileocolic plexus.

In the spastic, painful or left constipation, he resects the inferior mesenteric plexus around the mesenteric vessels. He gets good results or aggravations of the condition.

He warns against the resection of the hypogastric plexus which is innocuous in the woman, but can be dangerous in the man as this is the way for the ejaculation reflex.

The author had a case of left painful constipation rebellious to all previous forms of treatment. Upon request of the patient who asked for some relief, and with all the theoretical knowledge gathered from the literature he decided to perform a left semilunar ganglionectomy.



The patient had not evacuated sometimes for up to fifteen days in spite of the administration of cathartics daily. The clinical and radiological findings failed to demonstrate any organic reason. The rectum was examined with the rectoscope for 30 cm and the feces were normal.

The operation was performed under peridural anesthesia. A lateral incision like the Israel incision for nephrectomy was made. The muscular layers were retracted through the triangle of Petit with the technique described by Eckhorn. The left phrenic nerve coming out between the *crus mediale* and the *crus intermedium* of the diaphragm was investigated.

Section of the left phrenic nerve was followed by emilunar ganglionectomy. The wound was sutured with catgut.

The examination of the specimen taken in the operation showed a sympathetic ganglion.

Three days after the operation the patient felt intense heat in the zone of the wound and the left leg which increased with purgatives and brought relief.

On the 17th day there was a spontaneous evacuation of the bowels and on the seventh day another evacuation without pain in the abdomen.

The x rays after thirty days showed no changes but the patient relieved his bowels daily without laxatives had no pains reported an increase of 7 kgm of weight and felt very well.

The author hopes that new cases will show the real value of this procedure and the correctness of its theoretical basis.

HECTOR MARINO M D

Dulin J W and Peterson F R. Intestinal Obstruction Due to Gall Stones. A Report of 10 Cases. *Arch Surg* 1939 38 351.

Although intestinal obstruction due to gall stones is admittedly a relatively rare condition 10 cases were collected in a period of ten years. These cases account for 5.3 per cent of all intestinal obstructions at the University of Iowa Hospital during the ten year period. Gall stones large enough to produce obstruction usually pass through a fistula between the gall bladder and the bowel.

The diagnosis of this condition may be very difficult since the early obstructive symptoms are easily misinterpreted as being due to an acute biliary colic. The onset of acute obstruction in an individual having a previous history of gall bladder disease should make one suspect the presence of an obstructing stone. A teleroentgenogram of the abdomen may prove diagnostically helpful in two ways: (1) a radio opaque stone may be observed and (2) distended loops of small intestine with fluid levels may lead to a diagnosis of obstruction.

In the cases presented the diagnosis was made preoperatively in only 3 of the 10 cases. Surgery was undertaken in 8 of them as the patients in the 2 other cases were practically moribund on admission. The prognosis is poor in cases of obstruction which is caused by gall stones as is shown by the fact that only 4 of the 8 individuals who were operated upon

survived and the 2 who were not operated upon died.

LUTHER H WOLFF M D

Bottin J. Death in High Obstruction of the Intestine Due Primarily to Intoxication Dehydration as of Secondary Significance. (La mort à la suite d'une obstruction haute de l'intestin est due en première importance à une intoxication et secondairement à une déshydratation). *Rev belge d sc méd* 1938 10 587.

Formerly death from obstruction of the small intestine was attributed always to intoxication. More recently it was believed that only in obstruction of the lower part of the small intestine could intoxication be considered as the principal cause of death and that in cases of obstruction of the higher portions of the small intestine death was primarily and exclusively due to dehydration. The latter theory has been taken for granted by many writers who have never investigated this problem personally. Those with a better acquaintance of the subject are usually much more reserved in their opinion and nearly always admit an involvement of both processes. The present writer goes even farther and in his study that the cause of death in obstruction of the upper portion of the small intestine is primarily intoxication.

The literature on dehydration and demineralization is reviewed. Animal experiments conducted by the author revealed that whereas a certain number of animals made interesting recoveries following saline injections a considerable number showed no effect from this treatment and succumbed. He then studied the animals which survived following enterostomy below the obstruction. The experimental findings of Jenlins and of Jenlins and Bleswick are contradictory to the theory of a primary fatal dehydration in 55 and 77 per cent of the cases respectively and thus are in agreement with those of the author.

Even though dehydration and demineralization are common in obstruction of the upper portion of the small intestine they are far from being constant or constantly acute even if these conditions are corrected death is delayed in the majority of cases only for an insignificant period. Clinical and laboratory conditions associated with much more marked demineralization and dehydration than noted in high obstruction of the intestine do not usually lead to a fatal termination if death does ensue it occurs at a much later period. These facts do not diminish the importance of the factors of dehydration and demineralization. Rehydration and remineralization may prevent death due to high intestinal obstruction in more animals than exclusion of the pancreas but the results are much more inconstant and irregular. The author has performed many experiments with exclusion of the pancreas. He concludes that high intestinal obstruction as well as low obstruction of the small intestine leads to an intoxication which represents the primary cause of death. The course of the disease depends not upon the existence of dehydration or demineralization but upon the distance of

the obstruction from the duodenopancreatic tract  
EDITH SCHANCE MOORE

Lockhart Mummery J P Late Results in Diverticulitis *Lancet* 1938 235 1401

An analysis of the results obtained in the treatment of 136 cases of diverticulitis is presented. Ninety one of the author's patients were treated by operation. There were 15 deaths i.e. a mortality of about 10 per cent of all the cases. In 13 patients the involved portion of the colon was freed from other structures, and omentum was wrapped around it and held in position with fine catgut sutures. A colostomy, usually in the transverse colon was carried out in the cases of 38 patients. The author believes this to be the most satisfactory type of treatment and the safest method of dealing with severe cases of diverticulitis which do not respond to medical treatment. In 17 patients the diseased portion of intestine was resected with temporary cecostomy or colostomy. The artificial anus should remain at least one year or until all signs of sepsis have disappeared. This is advocated as the ideal treatment when the area involved is small.

Exploratory laparotomy was performed in 43 patients. In this group were many cases of acute perforation with abscess formation which could only be drained. In 2 of the patients, carcinoma developed in the sinus tract. Appendicostomy was carried out in the cases of 5 patients who failed to respond to medical treatment. This procedure may be used instead of colostomy. Twelve patients developed a vesicocolic fistula. In only one instance however, was this responsible for a fatal pyelitis. All 12 patients were treated by colostomy followed by resection of the infected colon and closure of the fistula after signs of infection had subsided. Chronic septic foci developed subsequently in 14 patients of the entire group.

It was emphasized that patients with diverticulitis should be kept on a strict mineral oil regime with a check up examination by barium enema at yearly intervals. If complications result despite this careful medical treatment surgery such as has been described must be carried out depending upon the type of complication. ROBERT ZOLLINGER M.D.

Browder J and Jett Jackson C The Surgical Treatment of Congenital Megacolon *Brooklyn Hosp J* 1939 15

Since Wade and Royle reported favorable alteration of obstipation associated with congenital megacolon by lumbar ramusectomy there have been 2 varieties of operations carried out in the 74 recorded cases resulting in satisfactory effects in all but 3 instances.

In view of the many types of operative procedures employed to interrupt the sympathetic nerve supply to the colon rectum and anal sphincters the authors review the present anatomical and physiological conception of the autonomic nerve supply to the viscera and anal sphincters. They conclude that

the present knowledge concerning the form and function of these nerves is deficient. Of considerable importance, however, is the contention of Lelford and Stopford that parasympathetic fibers arise from the anterior roots of the sacral nerves and form a trunk which joins the ventral aspect of the superior hypogastric plexus. They describe two bundles which can be traced to a point where they converge to meet and pass to the left side of this plexus. This small trunk can be followed cephalad to the inferior mesenteric plexus, which it joins distal to the origin of the inferior mesenteric artery. Thus, they assert, represents the parasympathetic nerve supply to the distal half of the colon. The parasympathetic innervation of the anal sphincters is derived from the pelvic plexus.

While certain principal anatomical facts seem well established yet the physiological action attributed to this system of fibers in man is relatively speculative. It may be reasonably stated for general purposes that the parasympathetic influence is excitatory to the smooth muscle of the colon and inhibitory to the internal anal sphincter, while the sympathetic system transmits inhibitory impulses to the intestine and excitatory impulses to the sphincter.

The etiology and pathogenesis of Hirschsprung's disease or congenital megacolon is not clearly understood. The dysfunction of the colon may vary from a complete absence of expulsive power, resulting in death during early infancy, to normal function throughout a long life. The outstanding argument in support of the neurogenic origin of the disease is the observation that not infrequently dilatation of the urinary bladder and ureters can be demonstrated. The authors report 2 such cases. They report a rare type of colon involvement characterized by dilatation and hypertrophy of a short segment of the proximal sigmoid colon. Since this segment was so far removed from the sphincteric influence, it suggests a very peripheral disturbance in the nerve supply. In this case a presacral neurectomy and division of the colonic sympathetic nerves as they join the inferior mesenteric artery was performed. After completion of this part of the operation, a nerve branch arising from the last lumbar sympathetic ganglion on the left was noted and since its ramifications could not be identified the ganglion was removed. Spontaneous defecation occurred on the eighth postoperative day, and has continued twice a day since. Subsequent x ray studies in this case show the involved portion of the colon unchanged in diameter. In all of these cases the dilatation and smooth contour of the megacolon persist after sympathectomy as indicated by comparative x ray studies although a good functional result is obtained.

The development of the present day surgical procedures in the treatment of this disorder has been traced from the various operations on the colon with high mortality and unsatisfactory final results to the acceptance of partial denervation of the colon with good functional results. The end result depends to a large extent upon the proper selection of the operative procedure to be employed in a given case. No

patient with Hirschsprung's disease should have a sympathectomy until adequately treated with aperient medicines and foods.

The procedure of choice in the female is presacral neurectomy and inferior ganglionectomy. This operation in the adult male results in paralysis of the ejaculatory mechanism but without demonstrable disturbance in potency. It has been shown that lumbar ganglionectomy removal of the lower three paired ganglia will improve the obstipation even though the chain alone on the left side is excised. This method is to be preferred when subsequent sterility in the male is to be avoided. The recent operation of Adson bilateral excision of the semi-lunar and upper two lumbar ganglia is suggested for use in patients in whom the entire colon is implicated by the disease or when the dysfunction has not responded to lower lumbar ganglionectomy and/or pre-sacral neurectomy. This operation likewise will produce sterility in the male.

The authors present a chart summarizing 7 cases of congenital megacolon each of which was subjected to surgical interruption of a part of the sympathetic nerve supply to the colon and anal sphincters. One case required a second operation since the first was limited to excision of the last two lumbar sympathetic ganglia on the left side and produced only a transitory beneficial result. This was followed by presacral neurectomy inferior mesenteric ganglionectomy and colonic splanchnic neurectomy which produced a satisfactory functional result.

JOHN E. KIRKPATRICK, M.D.

Wylie, Sir D. Surgery of Malignant Disease of the Colon. *Edinburgh M. J.* 1939 46 1

There are certain factors favorable to successful surgery of the cancer of the colon: its relatively slow growth; its tendency to remain local for many months; and its situation in an organ of which large parts can be extirpated without subsequent impairment in health. On the other hand, there are many factors which introduce difficulty both with regard to delay in the diagnosis and to success in the operative removal of the disease. Carcinoma of the colon has a long latent period during which it causes few if any recognizable symptoms and little if any deterioration in health. Until there is a large ulcerative surface or such a narrowing of the lumen of the bowel that interference with the passage of fecal content leads to stasis and symptoms of obstruction, the patient is not alarmed or inconvenienced and sees no need for medical advice. In all but exceptional cases, therefore, the disease has been present for at least a year before a diagnosis is made. Frequently an extensive growth with secondary anemia or a constricting growth causing subacute or acute obstruction is the condition first found by the doctor.

The operation for removal of a colon growth is rendered difficult and dangerous because of the infective content of the bowel, the uneven contour and varied thickness of the bowel wall, the precarious blood supply and the liability to flatulent distention.

Clinically we distinguish two types of growth: an annular scirrhous cancer, typically met in the distal part of the colon and liable to cause obstruction and a fungating ulcerative tumor usually found in the proximal part of the colon which is liable to bleed freely, break down and cause anemia and weakness but with little tendency to obstruct the bowel.

In the proximal part of the colon with its absorptive function and consequent free lymphatic drainage lymph involvement is earlier and more extensive than in the distal part of the colon, the function of which is storage and the lymph drainage of which is therefore sparse. Metastasis to the liver is fortunately not an early complication in the great majority of cases. It occurs less often than in cases of carcinoma of the rectum. It is however very prone to occur when the disease affects the distal colon in young subjects. On several occasions the first evidence of trouble in such cases has been the appearance of jaundice with marked hepatic enlargement.

In the proximal part of the colon carcinoma gives rise to constitutional symptoms in the distal part of the colon to local obstructive effects.

Three forms of x-ray examination are especially useful. A flat roentgenogram of the abdomen may show gaseous distention ending abruptly at the site of the tumor. A barium enema may show complete retention in some part of the colon or a persistent filling defect. If both of the former are negative a double contrast enema, i.e. a filling of the colon with air after a barium enema has been evacuated, may throw up in relief a polypoid or fungating growth which was obscured by the barium shadow. A barium meal examination is better avoided. It gives as a rule inconclusive evidence and if there be a narrow constriction the barium may accumulate above it and defy complete evacuation.

In cases of a growth in the pelvic colon or pelvic rectal region visual examination through the sigmoidoscope may give the final proof, and in the early case may supply the only convincing evidence that a growth is present. The barium enema roentgenogram is not the alternative to this method of examination; the one should supplement the other.

It is seldom necessary to open the abdomen for diagnosis and an exploratory operation is not justified until all of the diagnostic methods have been tried.

Successful surgery depends on preparation of the patient in some cases by drainage of the gut, in others by preliminary immunization or by blood transfusion. The author advocates the combined use of pre-operative inoculation with vaccines of virulent streptococci and colon bacilli with the stimulation of a pre-operative leucocytosis by the subcutaneous injection of sodium nucleinate the night before operation.

There is one factor favoring gangrene at the seat of a colon anastomosis and that is the presence of anaerobic organisms within the bowel. The flourish on devitalized material and may cause a spreading gangrene. Hence the three rows of continuous

suture, employed some years ago, instead of being a safeguard against, were often the cause of the late leakage. The continuous sutures cut off the blood supply from the cut margins of the colon on these devitalized margins the anaerobes flourished and commenced a spreading thrombotic gangrene in the adjacent wall.

There must be no tension at the suture line and this result is secured by adequate mobilization of the colon so that the ends to be sutured lie together with out any pull or drag in the long axis of the bowel. Also, what strain there is must be equally distributed around the circumference of the bowel. In the colon this can be achieved only by dividing the longitudinal muscular bands and so undoing the pouching and puckering which they normally induce. Then by making a cuff around the bowel down to the submucous coat and applying a light crushing clamp of the Schoemaker type before dividing the bowel, the surgeon can readily bring the cut ends together and unite them by the so called aseptic anastomosis, using only one row of interrupted Lembert sutures of fine linen thread.

If operation by stages is deemed advisable, an interval not of days but of weeks between the stages should be given. Avoidance of tension and conservation of the blood supply to the cut ends of the colon are the secrets of successful end to end anastomosis. In all cases in which the liver and peritoneum are not involved, radical operation should be considered even though multiple resections are required. The late results are very gratifying, and indeed better than in any other form of visceral carcinoma.

JOSEPH K. NARAT, M.D.

**Petacci, M.** Two Cases of Hemorrhagic Infarct of the Cecum. Ileocecolic Resection Cure (Due casi di infarto emorragico del ceco. Resezione ileocecolica. Guarigione). *Minerva medica* 1938 29 448

Petacci discusses 2 patients who were admitted with the diagnosis of acute appendicitis and who were found at operation to have a normal appendix but a tumefaction of the cecum that was on the verge of perforation. The second case was more serious than the first; both patients presented hemorrhagic infarction of the wall of the cecum with necrosis of part of the mucosa. In both cases ileocecolic resection resulted in cure.

These 2 cases represented different stages of the same anatomical lesion: the first case was encountered some time after the occurrence of the hemorrhage and showed partial repair through a reticular sclerosis which caused a cavernous aspect in the intestinal wall with blood between the meshes of the network; the second case was more recent and showed extensive hemorrhagic infiltration, but already gave indications of evolution toward the later stage of the process. All the layers of the cecum in the second case and only the submucosa in the first case were involved. The hemorrhagic infarct explained the tumefaction and dehiscence of

the cecal wall, the migration of the bacteria from the mucosa to the muscularis and the serosa, and the invasion of the entire cecal wall by the septic process. The infarct was not due to vascular changes in the mesentery, for which no indications could be found, but to an intrinsic lesion of the cecal wall. This lesion can only have been an angioma with evolution toward fibrous stromatic tissue in the first case and toward extensive hemorrhage with a slight tendency toward fibrosis in the second case. A somewhat analogous behavior is seen in cutaneous angiomas which after remaining stationary for a long period suddenly increase in size, become hemorrhagic, and transform the tissues into a veritable mass of blood.

Simple excision of the cecal wall is insufficient in these cases because the sutures do not hold and the perforations made by the needle constitute a passage for the cecal contents. The softened cecal wall, infarcted with blood so as to acquire a thickness of more than 2 cm., has no tendency toward intorsion and is in imminent danger of rupture under manipulation while the inflammatory process is not limited, but spreads toward the ascending colon and the ileum. Under the circumstances, resection must be done in healthy tissue and the only recourse is a laterolateral anastomosis of the ileum with the transverse colon.

RICHARD KEMEL, M.D.

**Gardner, C. E. Jr.** The Conservative Management of Appendiceal Peritonitis. *South M. J.* 1939 32 157

The conservative management of appendiceal peritonitis is based upon sound physiological and surgical principles. Immediate removal of the acutely inflamed appendix before perforation represents the only means of controlling the appalling mortality of this disease. In the author's experience, approximately 1 in every 4 patients with appendicitis is admitted with peritonitis. Finney (1933) found 37.5 per cent. Keyes (1934) 50.3 per cent, and Ochsner, Gage and Garside (1930) 78.7 per cent of patients to have extension of infection beyond the appendix when they were first seen. Operative intervention in the patient with appendiceal peritonitis is a major procedure and it should be undertaken only by the experienced and skillful surgeon. The rationale of delaying operation in cases of appendiceal peritonitis is based upon the fact that a natural protecting mechanism exists within the abdomen which if left undisturbed is usually capable of causing the resolution or localization of the inflammation. This protective mechanism consists of the inflammatory response to the presence of irritation within the peritoneum, and is characterized by the outpouring of an exudate which is bactericidal and which contains leucocytes and fibrin. The fibrin agglutinates the peritoneal surfaces of the bowel, omentum and abdominal wall in an effort to wall off areas of inflammation from uncontaminated parts of the peritoneal cavity. This being possible, the bactericidal effect of the inflammatory

reaction is sufficient to cause complete resolution of the infection in the majority of properly managed cases. Such a protective mechanism is effective only if left undisturbed. The disturbing element may be any factor such as food and cathartics which stimulate peristaltic activity in the bowel or any mechanical procedure such as operation either of which may break up the protective barrier of agglutinated peritoneal surfaces and open the uncontaminated peritoneum to infection.

The author states that his present practice is to treat conservatively all forms of appendiceal peritonitis in children although formerly operation was delayed only in children in whom localization of the infection was beginning when the patient was first seen. He has used the conservative régime in 26 children. There were 3 deaths. Seven of the children had a generalized peritonitis on admission. In 18 the condition subsided completely and the children were discharged without operation to return in three months for appendectomy. Of these 16 entered with or developed palpable masses which subsided under the régime. In 7 abscesses formed which failed to subside and were drained. Two of the last group of patients died one of peritonitis and the other of a subphrenic abscess. One child with a diffuse peritonitis who was practically moribund on admission died without operation.

The author has not hesitated to use the conservative régime in the aged. Although in this group the mortality is higher than that for any other age it is still lower than the mortality which would occur as a result of immediate operation.

Proper management requires absolute rest of the intestinal tract, maintenance of adequate fluid, mineral and caloric intake by routes other than by mouth and careful observation for evidence of continued spread of the peritonitis and increase in size or rupture of an abscess. If these occur immediate operation becomes necessary.

The author reports a series of 111 patients with appendiceal peritonitis who were treated conservatively. In 80 (80 per cent) the condition subsided completely after an average of fifteen and one half days and the patients were discharged to return for interval appendectomy in three months. In 17 the condition failed to subside and abscesses formed which were drained in an average of nine days after admission.

The entire series of 317 patients with perforated appendices who were admitted to the surgical service of the Duke Hospital (Durham, N. C.) in the eight year period from 1930 to 1938 is divided into 2 groups. During the first four years when almost all cases were treated by immediate operation the mortality in the cases of 122 patients was 18 per cent. During the second four years with consistent use of delayed operation in all patients in whom a definite pre-operative diagnosis of a perforated appendix could be made the mortality was 9.7 per cent. In the entire series the mortality from immediate

operation was 15.5 per cent while that following the conservative régime was 8.1 per cent.

The incidence of complication in survivors of delayed operation was 5.6 per cent and in survivors of immediate operation 20 per cent. The average period of hospitalization of survivors of immediate operation was twenty six and two tenths days and of the group treated by delayed operation seventeen and three tenths days.

FILLA M. SALMONSEN

#### Harbitz H. E. Hematuria and Renal Calculus as a Complication After Appendectomy. *Acta chirurg. Scand.* 1939 81: 405

A review of 12 cases of hematuria following appendectomy which were personally observed by the author is presented.

The hematuria usually appeared within the first week after the operation and was most common in young females. It was not always of significance but at times it indicated a serious acute hemorrhagic nephritis ending in complete anuria. In some cases it seemed to be due to the early formation of urinary calculi after the appendectomy. The prognosis was good in all of the cases.

The author suggests an etiological relationship between the formation of the urinary calculi and the postoperative hematuria. ROBERT ZOLLINGER, M.D.

#### Blaisdell P. C. Operative Injury to the Anal Sphincter. *J. Am. Med. Ass.* 1939 112: 614

It is amazing how incomplete is the understanding of applied surgical anatomy of the anal sphincter mechanism and in consequence what degree of operative injury is done to this mechanism. The great divergence of opinion and conception of the anatomical structures as reflected in the literature warrant a thorough review of the subject such as the author has given which scraps a multitude of misinformed ideas and lays down certain fundamentals. While it is true that in many cases relative and total incontinence result from the vicious practice of postoperative packing the author points out that these tragedies are in the majority of instances due to injudicious surgical practice based on ignorance of the surgical anatomy of the region. The same factor is responsible to a great degree for the inordinately high rate of recurrence following operations for fistulas. Thus from righteous fear of injury to the sphincter mechanism and unfamiliarity with the applied surgical anatomy in relation to fistulectomy the balance swings between varying degrees of incontinence on one hand and avoidable recurrences on the other.

Much of the fault for these far too common and unwarranted errors must be laid at the door of the proctologist. While each proctologist has learned by his own experience the practical surgical anatomy adequate for his own use his written formulations on which others must depend for guidance have in many respects proved inadequate and conflicting. A survey of the literature brings out the

astounding fact that almost nowhere with the notable exception of Milligan and Morgan and an allusion by Hiller, is there any discussion whatever or even mention of the clinical recognition of the various component muscles. Amidst the numerous conflicting statements, practically the only point on which there is apparently almost universal tacit agreement is the fundamental premise that the separate muscles can be easily, accurately, and uniformly recognized at operation. The author is of the opinion that, far from being so simple as to merit almost alone its undebatable position, this fundamental problem of clinical identification of muscles is responsible more than anything else for such divergent expressions. Gross error exists in this basic premise so universally taken for granted.

The author points out that the inaccurate foundation of descriptive anatomy, commonly illustrated but not described in textbooks is largely responsible for the common misconceptions pertaining to anal anatomy and the relation of fistulas. Such simple relations depicted between the muscles and the simple and constant relation between fistulas and muscles do not exist, and the resultant clinical misinterpretations and erroneous assumptions are obviously sources of confusion.

For clear analysis in accordance with conditions as they actually exist, the author maintains that there are only two possible means of differentiating and recognizing these muscles clinically, namely by palpation and by sight (dissection). Almost exclusive dependence must more often than not be placed on palpation since operation involves commonly the limited exposure obtained with but a linear section or little more, of the tissues. This phase of the problem is therefore of major importance.

In attempting to discover other ways and means of recognizing the different structures, the author made numerous dissections in the autopsy room and studied gross and paraffin sections made in the laboratory. By means of these approaches to the problem he brought out the following salient points:

1 It is impossible to define the internal sphincter as a clearcut anatomical entity because no upper border exists, the so called internal sphincter being but the thickened lower border of the inner circular coat of the bowel. It would be comparable to determining where the handle of a baseball bat ends (Fig 1).

2 The external sphincter uniformly blends imperceptibly with the levator ani, and tearing of the muscle is usually necessary to separation (except of course at the anterior portion where the latter does not surround the anus). From the several approaches the author gained the impression that pus extension could readily separate the external sphincter from the (encircled) internal sphincter to the upper border of the former, but that, instead of breaking through here between the external sphincter and levator and thus completely separating the external sphincter, extension would more easily follow the

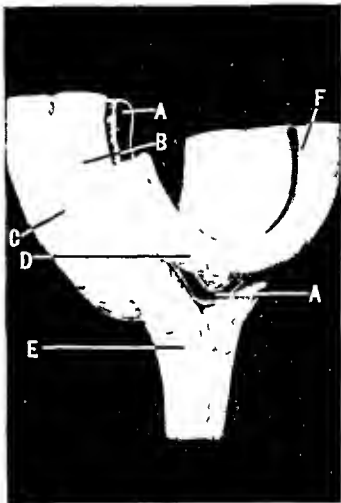


Fig 1 Model of anal anatomy reconstructed in accordance with paraffin sections and including conceptions of Milligan and Morgan. A lower border of internal sphincter. A small piece of the subcutaneous portion of the external sphincter has been cut away at the upper left to show how this portion and the internal sphincter are on the same vertical plane. B superficial portion of the external sphincter with diverging fibers F attaching to coccyx. C deep portion of external sphincter composed entirely of circular fibers. D subcutaneous portion of external sphincter consisting entirely of circular fibers which do not surround and support the internal sphincter as do the superficial and deep portions but are on the same vertical plane with it and separated from it by the anal intermuscular septum I.

strands of the longitudinal muscular coat of the bowel which course through the external sphincter.

With this laboratory work as a background, the author states that in all his experience with fistulas he has never found it necessary to identify the internal sphincter, and he believes that, as far as fistula surgery is concerned reference to the internal sphincter as a clinical entity should be discontinued.

In view of further clinical observations correlated with his laboratory findings the author suggests that the accepted concept of the surgical anatomy he rearranged to terms of (a) the subcutaneous

portion of the external sphincter and (b) the anal ring. The author believes this would obviate many of the difficulties outlined from the standpoint both of the specialist and of the occasional operator. Recognition of these structures is simple of acquirement; its use is adequate for the purpose and particularly effective because by correct anal palpation one can both continuously follow tracts by their scar tissue and be constantly informed of their relations to the anatomical structures.

MATTHIAS J. SEIBERT M.D.

### LIVER GALL BLADDER PANCREAS AND SPLEEN

Nadler W. H. Indications and Contraindications for Medical Management of Gall Bladder Disease. *Med. Clin. North Am.* 1939 23 43

Eight cases of cholecystic disease are reviewed and the subject is discussed from an internist's point of view.

In acute cholecystitis unless symptoms progress (in which event there is always pre-existing chronic disease with stones) medical measures suffice. In chronic cholecystitis without stones it is pointed out that medical treatment is rational and usually effective while surgery often fails to relieve symptoms. Cholelithiasis on the other hand is a surgical condition because of unpredictable serious complications. Even when the symptoms are slight unless there are special reasons for a contrary decision cholecystectomy at the earliest favorable or convenient time seems the safest procedure.

Pernster D. B. Aronsohn H. G. and Pepinsky R. Variation in the Cholesterol, Bile Pigment and Calcium Salts Contents of Gall Stones Formed in the Gall Bladder and in the Bile Ducts with the Degree of Associated Obstruction. *Ann. Surg.* 1939 109 161

Clinical and operative studies were made of cases of cholelithiasis and traumatic strictures of the ducts and chemical analyses, radiograms and roentgenographic powder diagrams were made of stones which were removed from the gall bladders and common and hepatic ducts. These investigations were made in an endeavor to throw light on the chemical composition of the stones as influenced by the site of formation and by any co-existing obstruction also on the source of the chemicals themselves whether they were derived from the bile or from the wall of the gall bladder.

It was observed that stones found in the gall bladder vary greatly in their contents of cholesterol pigment and inorganic calcium salts, one important cause of which is variation in the amount of associated obstruction of the cystic duct. Stones very rich in cholesterol may form in the gall bladder when stasis is mild as judged by the great frequency of dye visualization and when inflammation is mild or absent as judged by pathological examination. With increasing chronic obstruction of the cystic

duct there is a tendency for increasing amounts of calcium and bile pigments to be laid down on the pre-existing stones in the gall bladder.

If large stones partition the gall bladder and cause increasing stagnation within from ampulla to fundus there is a tendency for any further growth of the stones to consist of materials which increase in pigment and calcium contents from ampulla to fundus. With complete or almost complete obstruction of the cystic duct in the presence of low grade chronic cholecystitis calcium carbonate alone may be precipitated from the gall bladder fluid as a whitish deposit either about the pre-existing stones or as a separate mass.

In contrast with these findings stones formed in the bile ducts vary relatively little, consisting of bile pigments and cholesterol with very little or no calcium. Obstruction is an important cause of stone formation in the ducts since it is usually caused by the presence of a stone from the gall bladder which has lodged there. Persistent cholangitis with some degree of inflammatory obstruction appears to be a factor in the reformation of stones in the ducts after cholecystectomy and choledocholithotomy.

Calcium is present very largely as calcium carbonate. The source of the calcium carbonate is the wall of the gall bladder when it is thrown down within the gall bladder while the cystic duct is completely obstructed by a stone. Its source is also the wall of the gall bladder when it is deposited in layers on gall bladder stones in the presence of high grade but incomplete stone obstruction of the cystic duct. The facts that calcium is laid down in the gall bladder when its outlet is obstructed and that stone formed in the ducts contain little or no calcium are highly indicative that the calcium salts of gall stones are derived from the wall of the gall bladder and that little or none come from the bile.

The source of the cholesterol of calculi formed in the common duct after removal of the gall bladder is doubtless the bile.

The view that the cholesterol of gall stones formed in the gall bladder is also derived from the bile is favored by the finding of a decreased cholesterol content in gall stones formed when there is increased obstruction of the common duct while their calcium and pigment contents are increased also by the absence of cholesterol deposition when calcium carbonate is deposited within the gall bladder in the presence of complete obstruction of the cystic duct.

MANUEL E. LICHTENSTEIN M.D.

Massé L. Darmaillacq R. and Darmaillacq P. Glandular Cysts of the Pancreas (Les kystes glandulaires du pancréas). *Bordeaux chir.* 1939 10 10

The authors have made a complete survey of the literature and present 19 cases in detail. Three unpublished cases are included, 2 were personal observations. The 19 cases include only those in which the glandular nature of the cyst was recognized both at operation and on histological examination.

The authors make the following histological classification of glandular cysts of the pancreas: (1) polycystic disease of the pancreas, (2) cystic lymphangiomas, (3) dermoid cysts, (4) canalicular cysts, (5) cystic adenomas, and (6) cysto-epitheliomas. Under this classification the 19 cases presented 1 polycystic tumor, 2 canalicular cysts, 10 cystic adenomas, 7 adenocarcinomas, and 4 vegetative tumors of the cysto-epithelioma type.

From the histological and pathological studies two types of cysts are recognized: (1) those which have developed in the pancreas itself, and (2) those which have developed at the expense of embryonic debris included in the pancreatic parenchyma in the course of development. These are the vegetative cysts which behave almost as malignant tumors. Simple marsupialization will cure the first type, but only total excision will cure the vegetative cysts.

The macroscopical appearance of the cysts is as follows:

Most of the cysts have a smooth external wall with a slightly bluish or sometimes yellowish white appearance. The wall may be covered with very large dilated veins, is usually thickened to at least 2 cm., and is resistant. The interior of the cyst is variable according to the histological nature: it is sometimes unilocular, sometimes multilocular, and sometimes contains budding vegetations. The liquid contained in the cavity may be definitely bloody, chocolate colored, or clear, viscous, and opalescent. The dimensions of the cysts are exceedingly variable.

The pancreatic ferments may all be present or any one or any combination may exist.

The tail of the pancreas is the most frequent site of origin. The complete removal of these tumors presents serious difficulties for in developing the tumor contacts or adheres to neighboring tissues such as the duodenal arch, the spleen, the splenic pedicle, or the duodenojejunal angle.

The most frequent position of the cysts is intergastrocolic. The tumor compresses the stomach toward the diaphragm and the colon toward the pelvis, and bulges beneath the gastrocolic ligament. Cystic tumor of the pancreas is essentially a disease of adults: 3 patients were under twenty years of age, 3 were between twenty and thirty years, 6 were between thirty and forty, and 7 were more than forty years of age. The extreme ages were twelve and sixty-two years, respectively. As to sex, 15 were females and 4 were males.

There is no definite symptomatology or pathognomonic manifestation which will permit diagnosis of a cyst of the pancreas. In 8 of the 19 cases the tumors were the first symptom, in 5 functional troubles preceded the tumor, and in 6 the tumor and functional difficulties appeared simultaneously. Digestive troubles are frequent. A pancreatic syndrome of the external secretions has not been noted, nor is there glycosuria. Emaciation was noted in 5 cases. In 7 cases the tumor was located in the epigastric region, in 6 it was definitely located in the left hypochondrium, and in 3 it was to the right of

the umbilicus. In 12 cases the tumor was mobile, and in 3 immobile.

Röntgenological examination through the use of a barium enema or barium in the gastro-intestinal tract may help in the diagnosis by showing the organs markedly displaced. Urography is of value as an exact pre-operative diagnosis has been made in several instances by this means. Rupture into the peritoneum and jaundice are rare.

As regards treatment these tumors should be excised because they are almost insensible to roentgen rays. Two methods of treatment may be used: marsupialization of simple cysts of the pancreas without vegetation, and excision either of the cyst alone or of the cyst including part of the pancreas. In tumors with intracystic vegetations, only complete extirpation will give a cure, although a cure is not always technically possible. Only tumors limited to the tail justify pancreatectomy and then only if they are sufficiently free.

The operations in these 19 cases were: 2 pancreatectomies (left) with 1 death, 2 enucleations, 5 complete extirpations, 1 large but incomplete extirpation, and 9 marsupializations with 1 death.

RICHARD J. BENNETT, JR., M.D.

Gripwall, E. Hereditary Hemolytic Icterus and the Red Blood Cells (Zur Klinik und Pathologie des hereditären hämolytischen Ikterus mit besonderer Berücksichtigung des Verhaltens der roten Blutkörperchen). *Acta med. Scand.* 1938 Supp. 96.

This monograph is based on a study of 30 patients with hereditary hemolytic jaundice. In 21 cases the disease was familial. Splenectomy was done in 8 patients in 4 instances at an earlier period of life. Special studies were made of jaundice, anemia, splenomegaly, spherocytosis, and reticulocytosis as well as of the increased red cell fragility in hypotonic sodium chloride solutions. That all of these characteristic findings may not always be present in a given case was confirmed. There is great individual variability according to the intensity of the hemolysis and the adaptability of the organs that play an active part in blood formation. The anemia and the degree of jaundice show no definite correspondence, nor do the increase in red cell fragility and the degree of anemia and jaundice respectively. The sedimentation reaction revealed a peculiar type of "veiled sedimentation." The red blood cells were more vulnerable to heat treatment than normal blood corpuscles.

The studies carried out warranted the following conception of the pathogenetic mechanism: "The disease is based on a primary hereditary anomaly in the red corpuscles, which expresses itself both in a characteristic change in the shape of the red corpuscles and a decreased resistance to hypotonic sodium chloride solutions as well as to lysolectine. As an essential morbid factor there is added to this anomaly an increase in the spleen's physiological blood-destroying function due to an increased endopausal function. Through the abnormal func-



tion of the spleen the disposition of the disease is made manifest

The prognosis is generally good but acute de globulization may be caused by various exogenous factors notably infections. According to the unanimous experiences in the literature it cannot be doubted that splenectomy is the only safe therapeutic recourse. The risk of relapse after splenectomy is discussed and cases described in the literature are reviewed.

WALTER H. NADLER, M.D.

**Polowe D.** Splenectomy in the Treatment of Proved Subacute Bacterial Endocarditis. Report of a Case and Review of the Literature. *Irch Surg* 1939 38 139

Splenectomy was performed in 4 cases of proved subacute bacterial endocarditis and in 12 unproved cases. In the proved reported case the patient is alive and well more than twenty months after the operation. In the group of unproved cases 2 patients were alive and well at the time of the report and 4 patients lived from six to twelve months. In most of the cases in both groups the pain was relieved and it was the impression of most of the attending physicians that the patients had benefited from the procedure.

False positive Wassermann reactions may be obtained in some cases of subacute bacterial endocarditis.

It appears that the case reported is the first proved case of subacute bacterial endocarditis in which the patient recovered after splenectomy.

SAMUEL KANN, M.D.

### MISCELLANEOUS

**Thieme E. T.** A Critical Survey of Peritoneoscopy. *Surgerv* 1939 5 191

By peritoneoscopy is meant the direct inspection of the abdominal cavity by means of an optical instrument. The diagnostic possibilities of peritoneoscopy seem to merit a more widespread interest especially in view of the satisfactory results and the safety with which this procedure can be carried out. In order to determine the diagnostic value of peritoneoscopy a critical survey was conducted at the University Hospital Ann Arbor Michigan. The results of observations carried out on 50 selected cases are reported by the author.

Peritoneoscopy was rarely used as the preliminary study. In most instances it was resorted to after other means could supply only an inconclusive diagnosis or when biopsy or the operability of a clinically suspected neoplasm was desired. Peritoneoscopy was found to be entirely safe and very accurate. It is so accurate that it has come to be considered a valuable final authority in diagnosis which supplies much of the information usually gained by laparotomy with only a fraction of the expense and morbidity of a major operation.

The technique employed was essentially that described by Ruddock. Patients were prepared as

for laparotomy and all examinations were carried out aseptically. In order to allow more room for observation an enema was given which was followed by the administration of 1 ccm of pitressin to reduce intestinal volume. Morphine sulfate was the only sedative used. One per cent of procaine for local anesthesia was used and only the site of puncture was anesthetized. Local infiltration extended to all layers in an area of from 6 to 10 cm from the puncture site. As a result greater distention of the abdomen and painless manipulation of the instrument were possible. The incision was generally placed in the rectus muscle at the level of the umbilicus. As a matter of routine a nick in the fascia was made to facilitate the introduction of the large trocar. Room air of an unknown quantity and pressure were used for the pneumoperitoneum. In all instances the observations were successful though occasionally limited by adhesions.

Only cases that had been thoroughly studied by other means were accepted for peritoneoscopy from which the proper diagnosis from an array of clinical possibilities presented by a large teaching staff was expected. In a high percentage of cases the diagnostic problems presented in these situations were settled by peritoneoscopy.

The author divides the cases studied into the following general groups: (1) liver and spleen syndromes, (2) suspected abdominal malignancies, (3) unknown masses in the abdomen, (4) ascites of unknown origin and (5) tuberculous peritonitis.

With regard to the liver and spleen syndromes the clinical diagnosis of jaundice or of hepatosplenomegaly can seldom be accurate. It must however be obtained to guide rational treatment. The problem is accurately answered by peritoneoscopy and the therapeutic approach in jaundice and in hepatosplenomegaly is therefore indicated.

With regard to abdominal malignancies the author states that clinical findings alone cannot accurately disclose the inoperable carcinoma of the stomach and peritoneoscopy should be used routinely to avert operation in inoperable cases.

As to identification of unknown masses in the abdomen peritoneoscopy must be recommended with reservations. The extent of pelvic and abdominal neoplasms can be accurately estimated for proper treatment but peritoneoscopy cannot be expected to identify retroperitoneal masses unless they are far advanced.

Referring to ascites of unknown origin the author states that with thorough clinical study before peritoneoscopy the group of ascites of unknown origin will continue to be small but that peritoneoscopy may be expected to give the correct diagnosis.

Abdominal tuberculosis can be readily diagnosed and its course should be followed by repeated peritoneoscopic examinations.

It has been demonstrated repeatedly that peritoneoscopy used as a final check up after other clinical diagnoses have been made may reveal a

condition which is entirely at variance with these diagnoses and that a correction in the diagnosis may change the prognosis entirely.

MATTHIAS J SEIFERT, M D

Mondor H, and Olivier C. Spontaneous Hemoperitoneum in Men (L'hémopéritoine spontané chez l'homme) *J de chir* 1939, 53 1

Spontaneous hemoperitoneum in the male patient does not merit its reputation of rarity, and the condition should not be limited in the minds of surgeons to women alone, in whom the frequent cause is ectopic pregnancy. The authors have reviewed 400 cases of hemoperitoneum in men and women (of non genital origin in the latter) and they found that in only 9 of this number was the source of the bleeding "below the level of the umbilicus." It may be said that in men in whom intraperitoneal bleeding is suspected, the bleeding point may be expected to lie "above the umbilicus."

The most frequent site of the bleeding is in the spleen or one of its large vessels but spontaneous

rupture of any mesenteric, hepatic, or gastric artery, or even of the abdominal aorta itself, is also a possibility. Obviously, there are still other more obscure possibilities, many of which the authors point out.

The clinical picture must be thought of in terms of chronology, as the symptoms change with time. First there is usually upper abdominal pain, but as a rule there is not much change in the pulse or temperature. With the passing of time there may be some increase in the temperature, variable pulse changes, increasing pain, the appearance of abdominal rigidity or distention and, occasionally, vomiting. The temptation is to diagnose the condition as a ruptured peptic ulcer or, less likely, intra abdominal mesenteric hernia or volvulus, or bowel obstruction of undetermined origin. Almost invariably the incision should be made above the level of the umbilicus and the surgical procedure should be one directed to the discovery of the site of the bleeding. This task is always more difficult in the upper abdomen than it is in the pelvis.

JOHN MARTIN, M D

# GYNECOLOGY

## UTERUS

Black W T Chronic Cervicitis *J Am M Ass* 1939 112 191

A specimen for biopsy should be taken from every lesion of the cervix wherein there appears to be even the slightest possibility of malignant change.

A bacteriological study of 103 cultures showed that staphylococci and streptococci predominated.

Chronic cervicitis as a focus of infection should receive more thoughtful consideration. Pelvic pain, backache, menorrhagia, and at times distant symptoms may be relieved by cure of an infected cervix. A gain in weight and correction of nervous instability are often noted after proper treatment of a cervical infection.

Penetration of the uterine cavity materially increases the danger of infection, as trauma opens an area for bacterial invasion. Amputation should not be performed during the child-bearing age. A Sturmdorf operation or a modification of it is preferable. Plastic surgery still has a place in the treatment of cervical lesions in selected cases. Electro-surgical measures, however, have almost superseded other methods. A trachelorrhaphy is indicated for a laceration more than 1.5 cm in length. Smaller lacerations are best treated with the cautery, as the result is equally good and there is less danger of subsequent malignant change. The choice between cauterization and conization should be based on the type of cervical lesion found, i.e., whether it consists of a laceration, cystic formation, or extensive hypertrophy. The nulliparous cervix or the multiparous cervix without extensive disease may be treated by an electrosurgical procedure in the physician's office. In the presence of marked hypertrophy, many cysts and wide laceration, or when the patient is very nervous, the treatment should be carried out in the hospital with the help of a gas anesthetic.

If treatment is selected according to the nature of the lesion and the age of the patient and the necessary postoperative care is given, the outcome will, as a rule, be successful. Proper care of the diseased cervix will reduce malignant changes to a minimum.

CHARLES BARON, M.D.

Collins D G The Management of Tuberculosis of the Cervix Uteri *J Am M Ass* 1939 112 605

This study is based on a consideration of 191 cases of tuberculosis of the cervix. Six of these are new cases which the author is reporting for the first time; the others were collected from the literature. Fully 85 per cent of cervical lesions are secondary to a tuberculous focus elsewhere in the body; 55 per cent accompanied genito-urinary tuberculosis.

In the female generative tract, tuberculosis occurs most frequently in the fallopian tubes and the in-

cidence of the disease progressively diminishes in inverse proportion to the distance of the structure from the fimbriated end of the tube. It usually results from a descending infection that is spread by contiguity from foci situated higher in the pelvis, although it may reach the genitalia by the hematogenous or lymphatic routes.

Primary tuberculosis of the cervix is rare and for a given case to be classified as primary, the cervix must be the only tuberculous lesion which the patient harbors. Among the 185 cases collected from the literature there were 16 with primary lesions, and the author believes that the lesion in 1 of his 6 additional patients was also an example of this primary type.

The local lesion in the cervix may be ulcerative, papillary, miliary, or rarely the bacillary catarrhal type. The typical lesion is ulcerative, but it must be differentiated from hypertrophy of the cervix accompanied by eversion, erosions, myomas, polypoid tumefactions, and also from gonorrhea, syphilis, actinomycosis, and sarcoma, of course. The usual differential diagnosis is from carcinoma. Tuberculosis of the cervix is so rare and may assume such varied appearances that it rarely can be recognized at once, and almost invariably biopsy must be performed for a diagnosis. It may give rise to vaginal bleeding, even severe hemorrhages. It is not at all infrequent for the patient to complain of a foul leucorrheal discharge.

The preferred treatment is radical surgery. The operation should include a total hysterectomy with removal of the tubes, because there is usually extensive tuberculous disease of the upper generative tract; it is desirable to save one ovary if it is healthy. Local treatment of the cervical lesion is not advisable. X-ray and radium therapy often prove disappointing. Nevertheless, one sometimes is forced to resort to less radical measures because of certain contraindications to radical surgery, e.g., advanced local tuberculous lesions with extensive involvement of the bladder or rectum, severe tuberculous salpingitis, marked secondary infection, or active tuberculous foci elsewhere in the body.

The ultimate prognosis in tuberculosis of the cervix is dependent on the type of treatment employed together with the presence or absence of active tuberculosis elsewhere. GEORGE H. GARDNER, M.D.

Papin F Barroux R and Meigne J Hemangiomas of the Uterus (Les hémangiomes de l'utérus) *Rev franç de gynéc et obst* 1938 33 833

Papin and his associates note that hemangiomas of the uterus are of rare occurrence; they have found but 28 cases reported in the literature. They have analyzed 22 of these cases and report 1 case which had been operated upon ten years ago but had never been reported.

In the authors case the patient was a young woman twenty years of age with a large uterine tumor which had developed very rapidly and caused repeated uterine hemorrhages, a sarcoma of the uterus was suspected and hysterectomy was done. Histological examination showed a cavernous hemangioma. Of the reported cases only 4 were of this type of cavernous hemangioma which caused a considerable enlargement of the uterus. Three of the patients had repeated hemorrhages which were severe in 2 instances.

Histological study of the tumor in the authors case revealed that the vascular walls were of an embryonic type without the normal layers of blood vessel walls. In this case there had probably been a preliminary fibrosis in the walls of some of the capillaries which caused circulatory stasis and dilatation. The periodic menstrual flow was a factor in furthering this vascular dilatation.

The most common types of uterine hemangioma are localized mural or submucous angoma and fibroangioma. Nearly 20 such cases have been reported. These tumors are small but cause considerable bleeding. They were found either at autopsy or upon examination of the uterus after hysterectomy for repeated hemorrhages. Three cases of pelvic telangiectatic hemangiomas have been reported. Hemangiomas are not strictly speaking uterine tumors but are dilatations of the peruterine plexus in close contact with the uterus. One case of intra uterine cirsoid aneurysm also has been reported.

ALICE M. MEYERS

Stevens R. H. and Payne A. K. A Survey of 293 Cases of Cancer of the Cervix Uteri. *Am. J. Roentgenol.* 1939 41 55

The authors present several tables of statistics concerning 93 cases of carcinoma of the cervix 223 of which were treated by radiation therapy prior to 1933. In the list of 223 cases treated before 1933 there were 9 cases (4.4 per cent) of carcinoma of the cervical stump after supracervical amputation for fibroid tumor or after deduction of the cases unproved by biopsy there were 5 cases (3.8 per cent) of squamous cell carcinoma in cervical stumps. Of the 23 cases 137 were proved by biopsy and 20.4 per cent of these were cured for five years or more that is 20.4 per cent of the run of nine cases. Broders grading was used in nearly all cases in which biopsy was done. It appears that at least some tumors with a low grade of malignancy are radiosensitive while many of those with the higher grades are not.

Eleven patients in whom cauterization by the Percy soldering iron or by the electrocautery was done previous to irradiation did not live through the five year period.

For some time the authors have been concerned about the influence of infection in the treatment of carcinoma of the cervix. They are fully convinced that many more cases would be cured if ample time could be taken (one or two weeks) to prepare the patient for radiation treatment. As pointed out by

Regaud several years ago cancer and infection thrive together. It is probable that the traumatism of biopsy and of dilatation of the cervix for the insertion of radium carrying tubes would tend to spread infection from the vagina. Roentgen rays in moderate dosage seem to control many types of infection. They are applied without surgical aid such as is necessary in the application of radium in the uterine cavity. Therefore, the authors stress the administration of roentgen therapy in moderate dosage before radium therapy.

JOSEPH A. NARAT, M.D.

Schmitz H. Schmitz H. E. and Sheehan J. F. The Action of Doses of 800 Kilovolt Roentgen Rays on Carcinoma of the Uterine Cervix. *J. Am. M. Ass.* 1939 112 17

The solution of the problem of adequate control of carcinoma of the uterine cervix by irradiation with roentgen rays of about 800,000 voltage requires the study of the clinical aspects of the disease, the etiology, pathology and symptomatology as well as of the effect of the irradiation on the tumor and the cancer cells.

The favorable results of irradiation depend on many factors such as the histological index of malignancy, the sensitivity or resistance to irradiation and the dose of irradiation applied at the periphery of and within the tumor.

The dose of irradiation is the product of the quality or intensity of the irradiation and the duration of its application. The factors used in the production of the roentgen ray determine the quality. There were 800 kilovolts (maximum) obtained from a double pulsating Villard current with a load of 10 ma. on the x ray tube (which was rendered free from gas by oil vacuum pumps), a water cooled tungsten target, a filter equivalent to 10 mm. of copper, a focal skin distance of 70 or 86 cm., field sizes varying from 10 to 20 sq. cm. and a half value layer of 8.2 mm. of copper corresponding to an average wave length of 0.028 or a minimum wave length of 0.0128 angstrom unit.

Within from seven to ten days after the beginning of treatment hyperemia and capillary injection of the surface around the growth were seen. During the second week a whitish pseudomembrane covered the cervix and after twenty eight days necrosis appeared which produced a blackish green discoloration of the bed of the growth. From the sixth to the eighth week the necrotic tissue separated was cast off and left a granulating surface. This was followed by epithelization when the prognosis was favorable and by persistence of granulation or friability of tissue when it was unfavorable. Biopsy alone could show whether the condition was radiation necrosis, arrest of the growth of the tumor cells or recurrence or continuance of the primary carcinoma. Recurrence or persistence of the primary carcinoma requires additional treatment by irradiation.

The microscopic changes in the carcinomas included (1) swelling of the cytoplasm and nuclei of

the tumor cells the cytoplasm staining palely basophilic and the nuclei becoming more vascular with accentuation of the nucleoli (2) loss of regularity in the pattern of the tumor with increasingly great variation in size shape structure and staining qualities of the nuclei (3) increasing cornification in the masses of tumor cells predisposed to cornification (4) relative increase in abnormal mitoses and increase in the number of cell monsters i.e. cells with giant hyperchromatic nuclei or multiple nuclei (5) obliteration of the boundaries of cells (6) the occurrence of bizarre nuclear forms with irregularities of the nuclear membranes (7) karyolysis particularly marked in cells with palely basophilic swollen cytoplasm (8) pyknosis most marked in cells with giant hyperchromatic nuclei and rather strongly eosinophilic cytoplasm (9) neutrophilic infiltration in partially or completely cornified masses of cells (10) the presence of foreign body giant cells in apposition to masses of keratin (11) fine and coarse vacuolation of the tumor cells and (12) decrease in the size of sheets of tumor with relative increase in the amount of stroma

The changes in the fibromuscular coat of the cervix included (1) surface ulceration with necrosis and neutrophilic infiltration (2) a zone of edema beneath this layer with swelling of the capillary endothelium and granulations (3) swelling of the collagen and ultimate hyalinization often most marked around the capillaries and arterioles particularly in the deeper tissues (4) necrosis of the capillary endothelium and the walls of the arterioles with thromboses noted only at the margin of the necrotic surface (5) swelling of the collagen and hyalinization in the subendothelial tissues of the walls of the small arteries with narrowing or occlusion of the lumens and rarely with thrombosis which was more marked in the deeper vessels and (6) atrophy of smooth muscle

In the non cancerous cervical epithelium edema vesiculation and desquamation of the stratified squamous epithelium were noted. Relatively little variation in the columnar epithelium was encountered.

By the end of the first week of therapy (after the administration of about 1000 roentgens) the most notable change was rather uniform moderate swelling of the cytoplasm and nuclei of the Group 1 tumor cells. The swollen cells had a palely basophilic finely reticulated cytoplasm and their nuclei showed some vesiculation with accentuation of the nucleoli.

By the end of the second week (after the administration of about 2000 roentgens) a more marked effect was evident. Much of the regularity in the pattern of the untreated tumor had been lost. In tumors with Group 1 cell (not readily cornified) more marked variations in size shape and staining qualities of the nuclei were noted. Numerous cells of the large eosinophilic type with enlarged nucleoli were noted. Some of these were pyknotic. However the large palely basophilic type predominated.

Fine vacuolation of the cytoplasm and fading of the nuclei were noted in many of these. In tumors composed of Group 2 cells (readily cornified) the cornification of the central cells in the tumor masses had progressed at the expense of the mantle layer of spinal and transitional cells around them. The changes noted at this stage in the Group 1 cell had occurred in this mantle layer.

By the end of the third week (after about 3000 roentgens had been administered) the sheets of tumor cells were smaller than before and the cytoplasm and nuclear boundaries more irregular poorly defined or even indistinguishable. In tumors with Group 1 cells swelling seemed to have reached or to have passed its peak. More bizarre nuclear forms were noted. Vacuolation of the cytoplasm was rather marked. In tumors with Group 2 cells cornification was much more extensive some nests of tumor cells being completely cornified. The few transitional cells and spinal cells which persisted as a poorly defined mantle around some cornified cells showed changes described at this stage for Group 1 cells.

By the end of the fourth week (after treatment with about 4000 roentgens) the qualitative changes in Group 1 (non cornifying) cells were about the same as at the end of the third week but quantitatively more cells of the large eosinophilic type were noted and in these there was greater irregularity in the shape and outlines of the nuclei. Pyknosis in these was much more pronounced. Some of these giant nuclei robbed of cytoplasm persisted as large basophilic smudges. However the large palely basophilic cells were also in evidence. Karyolysis in these was much more marked some of the cells having lost their nuclei entirely.

No prognostic significance could be attached to the presence of numerous eosinophils in the inflammatory exudate of the tumors included in this series. In 2 cases in which their presence was a rather prominent feature the carcinoma had disappeared by the end of the second week of therapy. However in some cases in which the carcinoma persisted or recurred eosinophils were also in evidence particularly in 1 case in which recurrence and even invasion of the broad ligaments were noted shortly after the completion of therapy.

J THORNWELL WITHERSPOO M.D.

#### ADNEXAL AND PERIUTERINE CONDITIONS

Simonnet H and Robey M. Physiology of the Corpus Luteum. In the *Corpus Luteum of Menstruation* (Physiologie du corps jaune le corps jaune menstruel). *Gynec et obst* 1939 39 13.

Simonnet and Robey note that in some species of animals the corpus luteum phase is of short duration and minor importance. In women the corpus luteum persists fourteen or fifteen days as shown by histological studies of ovaries removed at operation in different phases of the menstrual cycle. Experimental studies dealing with the function of the

corpus luteum hormone give somewhat contradictory results. However, it has been shown that the corpus luteum hormone (progesterone) acting synergistically with folliculin produces changes in the endometrium, it also acts to inhibit the secretion of folliculin through the pituitary gland at the end of the menstrual cycle. If fertilization of the ovum and pregnancy do not occur the luteinizing factor of the gonadotropic anterior pituitary hormone is replaced by the folliculin stimulating hormone and the corpus luteum degenerates.

The role of the corpus luteum is definitely subordinate to that of the follicle, it functions only secondarily to the action of the follicular hormone. The follicular hormone is the essential ovarian hormone that is responsible for the female sex characteristics. The corpus luteum hormone acts synergistically with the follicular hormone but only temporarily even in the period when its influence is preponderant, i.e., in pregnancy. ALICE M. MEYERS

Simonnet H., and Robey M. Physiology of the Corpus Luteum. The Corpus Luteum of Pregnancy (Physiologie du corps jaune le corps jaune gravidique) *Gynéc et obst.* 1939 39 5

Simonnet and Robey state that the corpus luteum is formed by luteinization of the follicle under hormonal stimulation if ovulation has occurred a true corpus luteum is formed but luteinization may occur in the absence of ovulation with the formation of a false corpus luteum. The corpus luteum of pregnancy is a true corpus luteum prior to fertilization of the ovum it maintains the nutrition of the ovum during its passage through the fallopian tubes and determines the pregravidic changes in the uterine mucosa for which the preliminary action of folliculin is necessary. When fertilization of the ovum has occurred and nidation is complete the corpus luteum does not regress but persists and undergoes certain changes as shown by the appearance of colloids and the increase in lipoids the maturation of follicles and ovulation are suspended during pregnancy.

In some species of animals the excision of the corpus luteum interrupts pregnancy at any stage but in other species and in human beings, the presence of the corpus luteum is necessary only in the first part of pregnancy. Experiments have shown that in the latter group the placenta contains a principle which has an action similar to corpus luteum extract in its effect on the endometrium and its inhibiting effect on the uterine contractions. This does not indicate however that under normal circumstances these functions which are necessary for the maintenance of pregnancy are not exercised by the corpus luteum. Involutional changes in the corpus luteum do not occur until later in pregnancy and finally the luteinizing action is suspended at the time of labor when quantitative and possibly qualitative changes occur in the estrogenic hormones. The secretion of milk depends primarily upon the action of a specific hormone of the anterior pituitary

lobe, but in order that this hormone may act, the mammary gland must have been prepared by the synergistic action of folliculin and progesterone during pregnancy. ALICE M. MEYERS

Miane J. and Gernez L. Ovarian Cysts in Children (Le kyste de l'ovaire chez l'enfant) *Gynécologie*, 1938 37 641

The relatively rare incidence of ovarian cysts in children has been the cause of the frequent errors in diagnosis of this condition. From the literature since 1869 the authors have been able to collect 245 cases in children up to fifteen years of age. In thirty years of personal experience they have seen only 5 cases in 1 of these which occurred in a newborn infant the cyst was very small. A study of the age incidence showed that 60 cases occurred in children up to five years of age 57 cases in children from five to ten years and 103 cases in children from ten to fifteen years of age. In a few isolated cases heredity seemed to have played a part similar cysts having been removed from mothers of the patients. Cysts of the ovaries have been observed in twins and in 2 sisters and 1 interesting case is reported in which a girl of fifteen years was operated upon for a cyst of the right ovary while her brother at the age of eighteen years was operated upon for cystic disease of the testicle and her mother presented a cyst of the vagina.

Among conditions mentioned as possible predisposing factors are listed bacillosis lymphatism anemia and masturbation with resulting pelvic congestion and congenital malformation. Some writers have insisted upon a racial influence finding the condition most common in the Anglo Saxon race. In India the condition is unknown.

The dermoid type of cyst was most common having constituted 46 per cent of the cases mucoid cysts occurred in 43 per cent and a mixed type of cyst occurred in 11 per cent. The side affected was not always recorded. Of 138 cysts 70 were on the right side 53 on the left side, and 15 were bilateral.

Histologically the dermoid and mucoid cysts show the same characteristics as in adults. Cysts of mixed type are apparently more common than hitherto suspected.

The cysts vary in size those of the mucoid type sometimes attaining an enormous size and weight in proportion to the age and height of the child. Cases have been reported in which the cyst weighed 50 kgm. and was as large as a six months pregnancy. The great length of the pedicle of most of these cysts is one cause of their frequent torsion although torsion has been described also in cysts with short pedicles. Adhesions formed in about one sixth of the cases usually in the cases complicated by infection or torsion.

Complicating lesions of adjacent organs are likewise dependent upon infection and torsion of the cyst but may also be encountered in association with very large uninfected cysts. Such lesions include aseptic peritoneal reactions with effusion, the

latter being frequently blood tinged in cases of torsion uterine displacement cystic disease of the ovaries congestion of the tubes cysts of the pouch of Douglas appendicitis compression of the bladder purulent cystitis and compression of the ureter with dilatation of the pelvis The uterus or tubes may be included in the torsion

As regards the symptoms 42 per cent of the cases were manifested by some complication The period of latency is characterized usually by functional symptoms including attacks of abdominal pain gastro-intestinal disturbances urinary disorders and precocious puberty Among the physical symptoms noted may be mentioned an enlargement of the abdomen caused usually by a ventrable tumor not merely by distention General symptoms are rare Emaciation without demonstrable cause may be noted An analytical study of these symptoms is presented on the basis of the cases reported in the literature

The pathogenesis of the most common complication torsion is probably best explained by the theories applied to this condition in adults that of oblique pressure being the most plausible The symptoms of torsion in children may be classified in three groups There may be (1) a sudden onset with fulminant evolution (23 cases) (2) successive attacks of torsion and detorsion of subacute nature (20 cases) or (3) slow insidious torsion usually discovered only at autopsy or operation (11 cases) Sudden pain nausea and vomiting gastro-intestinal disturbances urinary disorders urinary retention and pyuria may be observed Illustrative cases are described and the physical and general symptoms of torsion discussed Acute torsion may result in gangrene of both tumor and pedicle with fatal peritonitis unless an early intervention is instituted In 103 Lovell performed hysterectomy for such a condition in an infant of five months

Nine cases of rupture of an ovarian cyst in children have been reported in the literature The type of cyst was stated in only 6 of these 4 being mucoid and 2 dermoid Rupture occurred usually as the result of violent effort in games In some cases there may be a direct trauma with sudden rupture In other cases the rupture may develop more gradually Rupture may occur following suppurative or during delivery A case of rupture into the bladder has been reported In 4 cases uppurative of the sac of the cyst was described In Patterson's case suppurative of the cyst was due to the introduction of a foreign body into the genital tract If the cyst has been detected first diagnosis in such cases is easy Three of the 4 cases ended in recovery More or less abundant intracystic hemorrhages are frequently discovered at operation

Among other less frequent complications may be mentioned tuberculo of the sac hernia of the cyst and distant complications such as ascites pleurisy urinary retention intestinal occlusion and a phlebotomy

For purposes of diagnosis the pain symptom is not sufficiently characteristic to be of much value Con-

stipation and urinary retention are very common Menstrual disturbances are less frequent but of considerable diagnostic value as are likewise disorders of puberty and anomalous secondary characters which indicate ovarian dysfunction Once the tumor has attained some size compression of the abdominal organs also may give a clue The typical ovarian facies is rarely seen in children unless the cyst is out of all proportion to the size of the child Physical examination may reveal a diffusely distended abdomen and a clearly defined abdominopelvic tumor of smooth surface and more or less hard consistency which as a rule is very movable In the absence of abdominal symptoms rectal or vaginal palpation may reveal a pelvic tumor Rectal palpation should be a routine procedure as it will yield valuable information in two thirds of the cases Vaginal palpation is more difficult Roentgenography should be practiced more frequently than is the custom Other methods of examination which may be of use are uterosalpingography and rectal insufflation Puncture which was used so much in former days has been abandoned on account of the dangers involved

In the differential diagnosis of ovarian cyst in children one has to consider ascites tuberculous peritonitis megacolon tuberculosis of the mesenteric glands the enlarged abdomen of rickets abdominal tumor pregnancy renal tumor hydatid cysts of the liver and spleen cyst of the mesentery hematosalpinx tumor of the posterior cavity of the omentum wolffian cysts urinary retention and pelvic tumor Among the conditions which have to be taken into consideration in differential diagnosis of the complications of ovarian cysts in children the authors mention acute appendicitis intestinal invagination and intestinal occlusion Encysted tuberculous peritonitis strangulated hernia acute peritonitis pneumococcal peritonitis and less frequently pelvic abscess nephritic colic and pyelonephritic phlegmon and in older girls adnexal tumor extra uterine pregnancy hematosalpinx and hematometra may also enter into the differential diagnosis of ovarian cysts A positive diagnosis of rupture is based on the finding of an acute peritoneal syndrome In cases of suppurative the first thought is usually appendicitis or purulent appendiceal peritonitis A vesicular or adnexal origin is much less common

As regards treatment no detail could be obtained in 44 cases and 20 cases were diagnosed at autopsy Medical treatment was attempted in only 3 cases and consisted in puncture not followed by surgical operation it is of historic interest only Following puncture the fluid reforms very rapidly and in the past century it was customary to repeat this dangerous procedure as many as 3 4 5 or even 6 times

In all cases coming to operation in which puncture had been performed evisceration was considerably hindered by fluid in the abdomen or by peritoneal omental or intestinal adhesions In more recent

cases puncture has usually been performed only because of a mistaken diagnosis of ascites or peritoneal tuberculosis. Ovariectomy was done in 114 cases. In 5 cases a bilateral ovariectomy was required. Once diagnosis is established a subumbilical median laparotomy is performed which has occasionally to be extended above the umbilicus in very large cysts in young children. About 1 in every 18 cases requires puncture to permit exteriorization because of the large size of the cyst. In cases in which diagnosis was not certain the oblique incision paramedian laparotomy or paralateral laparotomy has been done. Ligation of the pedicle is simple in the absence of adhesions. The latter are common in cases with torsion and may necessitate multiple omental resections for liberation. Sigmoid hepatic and abdominal wall adhesions have been reported. Lee Secor described a fissure of the cyst. Several writers have noted bloody fluid in the abdominal cavity. In cases of torsion there may be pure blood. In cases in which the intraperitoneal fluid might be infected the pouch of Douglas must be drained with a Mikulicz tamponade in suppurative cysts. In 1 case that of an infant of five months complicating torsion of the uterus and adnexa necessitated hysterectomy. In 1 case of dermoid cyst of the ovary several smaller cysts of this type had to be removed from the pouch of Douglas. If the cyst is found to be markedly infected or adherent marsupialization is indicated.

After care is of prime importance in these cases. Ice should be kept on the abdomen during the first days and genital hygiene, vesical care and urinary disinfection are imperative. In cases of peritoneal reaction demonstrable during intervention ice rectal drop infusion and cardiotonics are indicated. Shock following operation developed in 4 cases ending fatally in 2. Hyperthermic pallor was noted in only 1 case that of a child of six years who recovered. Among other postoperative complications may be mentioned postoperative collapse, convulsions, repeated vomiting, a meningeal syndrome and parotitis.

The menstrual disturbances following the removal of ovarian cysts vary greatly. Menstruation may be precocious or irregular. Changes in the secondary sex characters have been described such as arrested development of the breasts or hair. One girl of ten years of age at the time of operation for ovarian cyst went through a normal labor and delivery six years later. The development of stubborn constipation and intestinal dysfunction have been reported as late sequelae.

In regard to the mortality rate no information could be obtained as to the outcome in 60 of 195 cases. In the remaining 135 cases the results were as follows:

	Cures	Deaths
Ovariectomy for simple cyst	53	6
Ovariectomy for cysts with torsion	64	2
Ovariectomy for ruptured cyst	2	4
Ovariectomy for suppurative cyst	3	1

I. DITTE SCHACHTL MOORE

Luzuy A. Virilizing Tumor of the Ovary (Tumeur masculinisante de l'ovaire) *Mém Acad de chir*, Par 1939 65 26

The case presented constitutes the first case of virilizing tumor of the ovary to be reported by a French surgeon. About 30 cases have been collected from the world literature during the past ten years. The patient, a girl of sixteen years, was admitted for amenorrhea of two years' duration which was accompanied by progressive virilization. Up to the age of fourteen years the menses having begun at the age of ten and one half years the patient had the appearance of a very robust girl. At this age amenorrhea developed and resisted all attempts at treatment. Six months after the onset of the amenorrhea, hair appeared on her face and chest, her voice became rough, her disposition irritable and her mentality retarded. No change was noted for the next eighteen months. Examination revealed an elongated clitoris (4 cm.), a normal vagina and a small uterine sac. The body of the uterus was not palpable. The ovarian tumor could not be palpated. Exploratory operation revealed an infantile uterus, a small left ovary of the size of a cherry and a tumor of the right ovary of the size of an orange. The right tube and ovary were removed and the patient made a smooth recovery. Five weeks after the operation a normal menstruation occurred and the periods had occurred regularly thereafter according to the patient when she was seen again seven months later. Her appearance regained its feminine character, the excessive hair disappeared almost completely, the breasts developed and the body became more feminine. The clitoris diminished to two thirds of its former size. The voice remained slightly deep.

Histological examination of the tumor revealed an arrhenoblastoma. The characteristic symptoms as illustrated in this case are discussed.

Hitherto the interventions practiced have been usually ovariectomy and occasionally hysterectomy. Roentgenotherapy proved futile in a case reported by Zachmary. Varangot has collected 29 cases in addition to the 31 mentioned here, but it has not been demonstrated that all were authentic.

The theories of the pathogenesis of these tumors promulgated by Meyer, Krock and MacLester are enumerated. They are all merely hypotheses however all that is actually known at present is that certain ovarian tumors of typical or atypical testicular structure present the peculiar clinical and endocrinological feature that they produce virilization which disappears after removal of the tumor.

EDITH SCHACHL MOORE

Delascio D. J. and Dellvenneri A. Pyosalpinx Rupture (Ruptura de pyosalpingeo) *Rev de obst e ginec de S Paulo* 1938 3 225

A pyosalpinx may rupture into the colon, rectum, bladder, uterus, vagina, anterior abdominal wall or the free peritoneum. The authors consider only rupture into the peritoneum. Rupture of a pyosalpinx is a rare accident in which the age of the patient



does not seem to play an important causative part although it occurs more frequently during the third decade the usual beginning of the sexual life in woman. Traumatism (due to coitus propedeutic and abortive maneuvers direct trauma of the abdominal wall strong purgatives and physical exercise) and pathological change in the tubal wall are the determining factors of rupture. The former causes real rupture which is hardly ever accompanied by *erious* peritonitis while the latter causes perforation which is nearly always accompanied by lethal peritonitis. Infection of the tube may occur through either opening or by the lymphatic or the circulatory route. The gonococcus accounts for infection in 75 per cent of the cases the streptococcus tubercle bacillus typhoid bacillus and pneumococcus follow in the order of frequency as causative agents of the infection. Beginning as an acute catarrhal inflammation the disorder may become purulent and ulcerating and the inflammatory process may close the two tubal orifices and cause hydrosalpinx hematosalpinx or pyosalpinx. In the presence of rupture of a pyosalpinx the other tube is usually affected also. The rupture occurs generally in the ampullar portion and although usually unilateral may be bilateral.

The symptoms of rupture are violent syncopeal pain vomiting high fever filiform pulse and marked abdominal defense. Gynecological examination causes great pain on exploration of the cul de sac of Douglas and a decrease in size or the disappearance of the previous found lateral tumor. The course of the rupture may be divided into a period of shock a period of relative quiescence and a period of generalized peritonitis. The peritonitis appears usually about the eighteenth hour after the accident. The diagnosis is not easy but careful anamnesis and gynecological examination will make it possible. The diagnosis includes differentiation of all the acute genital disorders of the abdomen but principally tubal pregnancy and appendicitis. Puncture of the cul de sac of Douglas should never be neglected. The prognosis is *erious* and its gravity depends on the nature of the causal microorganism the time of the intervention and the immediate cause of the perforation peritonitis due to traumatic rupture of an old pyosalpinx of low virulence is less *erious* than that occurring after a few days of prodromal symptom characterizing the aggravation of a recent pyosalpinx.

Patients with pyosalpinx observed before rupture should be subjected to absolute rest in bed and conservative treatment. In the presence of established rupture the French Italian American and Argentinian schools are in favor of a more or less radical intervention while the German and Viennese schools recommend simple abdominal or vaginal drainage based on conservation of the adnexa. The authors favor the latter treatment and consider two eventualities in cases in which the diagnosis is made they recommend vaginal drainage by means of posterior colpotomy when the diagnosis has not been

made and the accident is discovered during laparotomy they insist on abstention from any intervention on the adnexa and favor abdominal drainage combined with vaginal drainage. They describe a fatal case in which the diagnosis of generalized peritonitis due to ruptured appendix was made and a ruptured pyosalpinx was found at operation and removed. Examination of the pus revealed streptococci.

RICHARD KENEL M.D.

## MISCELLANEOUS

Arcey L. B. The Degree of Normal Menstrual Irregularity. *Am J Obst & Gynec* 1939 37 12

Some 20 000 calendar records from about 1 500 women and girls as given in 12 different studies have been assembled corrected and analyzed.

The commonest length of 8 462 cycles (furnished by 585 persons) considered as a unit is twenty eight days both for girls at the age of puberty and for adult women. The average length of all cycles is thirty three and nine tenths days for girls and twenty eight and four tenths days for women.

The commonest length of 17 652 cycles (the grand mode of the individual modes of 1 265 persons) is divided between thirty and thirty one days for young girls and twenty seven days for adult women. The mean length of cycle based on individual averages is thirty three and six tenths days for girls and twenty nine and five tenths days for women. Statements concerning grand means and modes however have little significance in young girls since they are so unrepresentative of the wide variability encountered. The maximum departures of individuals from their means extends from one to sixty nine days in adults and from six to two hundred and eleven days in young girls.

The smooth frequency distribution obtained from combining all the cycles of a group into one curve is the result of overlapping individual irregularities and not of regular individual performances.

The existence of favored subordinate types of cycle length (such as three five six and seven weeks) in addition to the modal type do not appear either in the massed cycles of groups or in the record of individual performance. This is in sharp contrast to the conclusions based upon oral testimony.

In the first few years of the menstrual function the cycle length is extremely variable (seven to two hundred and fifty six days). It can be calculated that during the period of observation employed (averaging 31 cycles per person) one third of the 100 young girls never had a cycle that corresponded with their own means. Only 1 girl experienced her own mean as often as once in three cycles. From the menarche to the twentieth or twenty fourth cycle only two-thirds of the total cycles of an average individual remained within a twenty day range above and below her mean. Yet in middle adolescence occupied by cycles 25 to 30 the regularity improved to such an extent that on the average two thirds of all the cycles kept within a ten day range.

At the end of adolescence, during the eighteenth and nineteenth years the variability is still further reduced. In the 35 individuals studied two thirds of the cycles kept within a range of plus four and four tenths days with respect to the mean.

In several hundred adults who were more than twenty one years of age, a fluctuation of about plus two and five tenths days, with respect to the mean, expresses the limits of variability which contain two thirds of all cycles. Expressed differently, an average adult woman must expect one third of all her cycles to depart more than two days from her mean cycle length.

The amount of variability shown by adults is greater than it is ordinarily believed to be. Cycles ranging from two or three weeks to seven or more weeks appear in all of the groups (seventeen to forty nine years) from which data have been collected. In the records of more than 500 women 27 per cent never showed their own means during the observation period, which averaged 11 cycles in length. Only 20 per cent experienced their own mean in at least one third of their recorded cycles.

The adults, reported in detail by 11 different investigators represent all ages, including the period from late adolescence to approaching menopause. They include American, Canadian, British German

and Hungarian subjects, of various grades of society. In no instance did an example of perfect menstrual regularity appear over any significant period of time, this is all the more noteworthy since many individuals had previously declared themselves to be the acme of invariability. The most regular records are short ones. In a separate (unpublished) study of menstrual records extending over a period of twenty years, it will be shown that temporary surreptions of atypical regularity, or irregularity may occasionally interpose themselves in a rhythm of fundamentally different characteristics. It is these unrepresentative fragments of the true record that sometimes lead to erroneous conclusions concerning an individual rhythm even a record extending for over a year may prove to be unrepresentative.

In the face of all these facts it seems improbable that menstrual regularity in any true sense of the word, ever will be encountered over significant periods of time. Certainly, not the slightest evidence pointing toward perfect regularity has so far been produced for even a single exceptional individual. Should such a person be found at some future time she will constitute a true medical curiosity.

Studies on the monkey and chimpanzee disclose menstrual irregularity comparable to that of the human being.

EDWARD I. CORNELL M.D.

# OBSTETRICS

## PREGNANCY AND ITS COMPLICATIONS

Sundelin G. Diabetes and Pregnancy (*Diabetes und Graviditæt*) *Nord med Tidsskr* 1938 p 1239

After the introduction of insulin the frequency of pregnancy in women with diabetes was increased from 2 to 15 per cent but it still continues to be low. Abortion is frequent the frequency is greater the higher the blood sugar. The insulin demand is increased at the beginning of pregnancy but toward the end it is decreased possibly because of the activity of the fetal pancreas. Pregnancy under normal conditions means a burdening of the metabolic processes and in diabetes this makes for a greater tendency toward toxemia. Polyhydramnios which before insulin treatment was found in about 25 per cent of the cases is now infrequent. At about the time of birth the greater instability of carbohydrate tolerance means an increased danger however by the author's method hyperglycemia and acidosis are guarded against and cases of diabetic death in childbirth are scarce. The mortality in a large number of cases was about 3 or 4 per cent whereas earlier it was about 50 per cent at birth and in the following months. For the fetus the prognosis is not bettered to a corresponding degree. Besides abortion and premature birth diabetes mellitus often produces intra uterine death of the fetus the reason for which is unknown. It is thought by some to be acidosis and by others to be hormonal disturbances. In poorly controlled cases as before in insulin pregnant children may develop and cause difficult birth. Malformations are more frequent in the children of diabetics. In the first hour after birth a hypoglycemia develops in the child. This probably occurs because during fetal life the pancreas is hypertrophied under the influence of the increased blood sugar and after birth the increased insulin production continues under changed relationships. Hypoglycemia has probably caused most of the deaths occurring shortly after birth. The fetal mortality if one includes the cases of death in the first hour after birth was 60 per cent since insulin treatment this percentage has been reduced although it still lies between 37 and 50 per cent.

In the University Women's Clinic in Lund from 1910 to 1936 15 patients were treated in 22 pregnancies. Of these only 1 was treated before insulin was used. The time between the onset of diabetes and the pregnancy varied from one to fifteen years. There seems to be a greater inclination toward fetal death when the disease has existed for a longer time before pregnancy. In 9 patients with severe diabetes the insulin demand was determined in 16 pregnancies not only during the pregnancy but also for some time before and after. The patients can be divided into 4 groups (1) with no change 4 patients in 9 pregnancies (2) in whom the condition

became worse 1 patient in 4 pregnancies (3) in whom the condition became better 1 patient in 3 pregnancies and (4) with varying relationships in different pregnancies (3 patients). The pregnancy birth and puerperium therefore proceeded in the majority without notable change in the carbohydrate tolerance. Complications were few eclampsia and polyhydramnios were not observed. In 1 case toxemia with renal insufficiency coma and premature birth occurred and were followed by rapid recovery from the kidney malady. In 1 case on account of toxemia cesarean section with sterilization was undertaken. In 2 cases versions were done. The puerperium was afebrile even after intra uterine intervention. The mortality for the mothers was 0 for the fetuses 45 per cent (4 abortions 4 still births and 2 deaths shortly after birth). A gigantic child was born in 1 case and a malformed child (acrania) in 1 case.

If a diabetic case becomes worse (acidosis) in spite of expert treatment during pregnancy or if another serious disease is present the pregnancy must be interrupted and sterilization performed as well. As parturition is approached one must be especially attentive to changes in the sugar tolerance. Since however the birth itself represents only a slight risk cesarean section should not be used except in special cases as for example in gigantism. At Lund when general anesthesia was contraindicated in cesarean section spinal anesthesia or local anesthesia of the abdominal wall were used instead. In simultaneous sterilization this procedure was supplemented by infiltration of the specially sensitive cornual portion of the fallopian tube.

(AXEL OLSEN) RONALD R. GREFE M.D.

Lantuejoul and Merger. Cardiopathy and Pregnancy the Indications for Surgical Intervention (*Cardiopathie et grossesse les indications de l'intervention chirurgicale*) *Gynec et obst* 1935 38 401

Since January 1935 Lantuejoul and Merger have found it advisable to intervene surgically in order to avoid labor or the evolution of pregnancy in 21 pregnant women suffering from heart disease. In all but 2 cases sterilization was performed as a complementary procedure. The intervention took place near the end of pregnancy in 7 cases and at the beginning of pregnancy in 14 cases. Local anesthesia was used when the functional condition of the patient was grave in ordinary cases spinal or general anesthesia served the purpose.

The 21 cases are divided into 3 groups. In the first group of 7 cases the uterus was emptied because of cardiac accidents endangering the life of the patients.

1. Near the end of pregnancy in 4 of 5 cases including 1 of Pott's disease the abdominal route was

used, and in the fifth case the vaginal route. All of the children and 4 of the mothers survived the remaining mother dying of asystole on the sixth day after the intervention.

2 One of 2 women with severe cardiopathy who were delivered before the fetus was viable died of cardiac insufficiency four days after the intervention the other died three years later from an unknown cause.

In the second group the uterus was emptied during the first months of pregnancy because of grave cardiac decompensation the aggravation of which coincided with the evolution of the pregnancy (5 cases). The functional symptoms which were considered alarming were decubitus dyspnea, hemoptysis, aggravation of the cyanosis and disturbances of the rhythm (extrasystoles, tachycardia and especially, total arrhythmia). One of these patients died on the seventh day after the intervention without showing signs of infection.

In the third group the uterus was emptied because of less decompensated cardiopathies which however, were considered too serious to permit the evolution of pregnancy, the occurrence of labor or the possibility of subsequent pregnancies (9 cases) in 7 cases the intervention took place before the fetus was viable and in 2 cases near the end of pregnancy.

In cases of this type the decision rests with the cardiologist, and the elements of surgical indication include various considerations such as the actual functional condition of the patient and the eventual aggravation since the beginning of pregnancy (after a period of rest and medical treatment have been tried), the study of behavior of the heart during previous pregnancies, the physical findings, the roentgenological study of the heart and at times, electrocardiography. The operative sequel was good in these 9 cases. RICHARD KEMEL M.D.

Bartholomew R. A. and Colvin E. D. Diagnosis of the Occurrence of Toxemia of Pregnancy by Examination of the Unknown Placenta. *Am J Obst & Gynec* 1938 36 909

Placental infarcts of the more acute types are definitely associated with toxemia of pregnancy. The hypercholesteremia of pregnancy is the basis for vascular changes in the placental arteries which predispose to infarction. Hypothyroidism and a diet rich in cholesterol containing foods are important factors in excessive hypercholesteremia. The trauma of fetal movements on the placental arteries in the latter part of pregnancy is not only a predisposing cause of localized cholesterol change in the vessels but also an exciting cause of thrombosis or rupture at the site of such change with resulting infarction.

The high content of arginin in placental tissue is the probable explanation of the specific eclamptic character of placental autolysis through the formation of guanidine. The known pathological effects of guanidine, peptone and histamine apparently explain the clinical and pathological manifestations of toxemia of pregnancy.

The results of a gross examination of 100 placentas from both toxic and normal cases as "unknowns," without knowledge of the clinical history shows that it is possible to diagnose the occurrence of severe toxemia in 90 per cent of the cases. Conversely, it is possible to predict the type of infarcts that will be found in the placenta from a knowledge of the clinical history of the pregnancy as to toxemia.

With the experience of examining placentas as 'unknowns' it has been found possible to establish criteria for an exact classification of placental infarcts and their relation to toxemia. The 8 types of infarcts are described and illustrated by color plates. Further study of the effects of cholesterol and the biochemical aspects of placental autolysis will clarify many of the clinical and pathological manifestations of toxemia of pregnancy and will undoubtedly throw considerable light on the subject of hypertension and arteriosclerosis. EDWARD L. CORNELL M.D.

Andérodias J. and Pery G. Indications for Low Cesarean Section in Amniotic Infection (Les indications de la césarienne basse dans l'infection amniotique). *Rev franç de gynéc et d'obst* 1939 34 1

Andérodias and Pery note that amniotic infection cannot occur until after the rupture of the membranes, if the fetus is living the infection does not become very severe, but if the fetus dies the amnion becomes a veritable culture medium, and the infection may rapidly become very severe. Three clinical types of amniotic infection are distinguished.

1. A mild type in which the temperature is slightly elevated (from 37° 5' to 38° C) and the patient has been in labor for some time and has been subjected to several vaginal examinations possibly before admission to the hospital. If rapid delivery *per vaginam* is impossible low cesarean section is indicated.

2. A moderately severe type with a temperature of from 38° to 39° C and definite signs of infection such as rapid pulse and fetid discharge. Even if the fetus is dead, low cesarean section may be done especially in primiparas in whom conservation of the uterus is desirable, if there is no formation of gas in the uterine cavity.

3. In the severe type of amniotic infection the fetus is dead, the discharge is fetid, the fever is high, the pulse rapid, chills may occur and the patient's general condition is poor. In such cases a high cesarean section followed by hysterectomy, or hysterectomy *en bloc*, is indicated.

In 83 cases of amniotic infection of the less severe types (Types 1 and 2) in which the temperature was above 37° 5' C, and in which low cesarean section was done there were 5 deaths: 2 from septicemia and 1 from puerperal infection. In 22 cases, or 17.5 per cent there were some puerperal complications (phlebitis (8 cases), abscess of the abdominal wall (6 cases), pulmonary symptoms (5 cases), and endometritis (3 cases). Death occurred most frequently in cases in which rupture of the membranes had occurred more than twenty four hours before operation. Puerperal

infections occurred more frequently in patients with a temperature above  $38^{\circ}\text{C}$  than in those with a temperature of from  $37.5$  to  $38^{\circ}\text{C}$

ALICE M. MEYERS

### LABOR AND ITS COMPLICATIONS

Wegelius C. The Differences Between Radiological and Anatomical Measurements in Determination of the Size of the Fetus Skull Roentgenologically. *Acta obst et gynec Scand* 1938 18 428

There are two projectional errors which occur in the measurement of the pelvis and the fetal skull roentgenologically: (1) the enlargement of the picture due to beam divergence and (2) the diminution and distortion of the picture due to the obliquity of the object to the film. So far as the pelvis is concerned the effect of these factors can be corrected satisfactorily by a variety of methods. However in the measurement of the skull present methods have corrected for the enlargement of the picture due to beam divergence but satisfactory methods of correction for the obliquity have not been developed.

In order to correct the obliquity it is necessary first to determine the position of the skull, i.e. the degree of the oblique position; it is then necessary to know the percentage of the foreshortening effect of all the obstetrically important parts of the skull in all possible degrees of obliquity. The first can be accomplished by taking a picture of the pelvic opening which allows one to read off directly the position of the sagittal suture. If this view cannot be obtained the determination of the position of the skull must be based upon an internal examination made as soon as possible before or after the side view has been taken. Upon the latter is based the determination of the size of the pelvis and of the fetal skull. To fulfill the second requirement that of obtaining figures for the percentage of foreshortening in different oblique positions the author has conducted a series of investigations. These were made upon 10 fetal skulls which had not been delivered and were all from pregnancies within two months of term. The figures determined were for the two most important circumferences from the obstetrical point of view: the one running around the skull through the end points of the fronto-occipital and biparietal diameters, the other through the end points of the mento-occipital diameter. These were compared with the anatomical measurements. The foreshortening was calculated as a percentage of the picture measurement which had been corrected for the divergence enlargement. This percentage gives the amount by which the picture measurement must be increased to obtain the anatomically correct size. Taking the fronto-occipital projection as 0 the skulls were rotated  $180$  degrees in the plane of the circumference while the foreshortening was measured at intervals of  $5$  degrees. The figures which were tabulated show a striking similarity for the 10 skulls at similar positions. The foreshortening

proved to be anything up to 20 per cent, which was sufficient to be of clinical importance. The findings are given graphically as well as in table form.

DANIEL G. MORTON, M.D.

Thoms H. Routine Roentgen Pelvimetry in 600 Primiparous White Women Consecutively Delivered at Term. *Am J Obst & Gynec* 1939 37 109

From this and other studies one must reconstruct the views which were previously held with regard to the architecture of the female pelvis. The incidence of the brachypelvic type in but one third of the series makes it appear that this type does not represent the norm in the adult white women of America. Studies now under way on a group of prepubescent girls have shown this type of pelvis to be relatively infrequent. It is the author's opinion that environmental influences, especially in early life and during puberty, may be of some significance in determining the configuration of the adult pelvis. In the platypelvic type in this series certain sacral changes suggest that rickets probably plays a major rôle as an etiological factor.

That the dolichopelvic and mesatipelvic types appear to facilitate spontaneous delivery is further evidenced by the incidence of cesarean section in these two groups: 0 per cent and 0.7 per cent respectively, while in the brachypelvic and platypelvic types the incidence is 4.3 per cent and 15.4 per cent respectively. The incidence of operative intervention of all kinds in the series shows the same trend.

The routine use of simple inexpensive roentgenological methods, especially in primiparous women at term, possesses many advantages. Not the least of these is the knowledge we are bound to gain in the treatment of cases of real and suspected disproportion. The use of the lateral roentgenogram during the test of labor makes for scientific accuracy.

EDWARD L. CORVELL, M.D.

Kuehnle P. The Treatment of Uterine Atony in Labor by Means of Scalp Forceps. *Acta obst et gynec Scand* 1933 13 466

The use of traction on forceps attached to the scalp for uterine atony was suggested by the pains which were initiated by this procedure in the treatment of certain cases of placenta previa. Willet first described the method in 1925 and devised a suitable forceps. Since that time 43 cases of placenta previa treated in this manner have been reported. The author has used it in 6 cases in which all of the mothers and 4 of the babies survived.

The author believes that there is a physiological basis for improvement in contractions when traction is exerted upon the scalp. The reason suggested is the pressure exerted upon the paracervical and retrocervical tissues which in turn causes irritation of the Frankenhauser plexus by which pathway labor pains are elicited.

The forceps employed is nothing more than an elongated slightly curved double toothed tenaculum.

lum. A string tied to the handles is run over a pulley at the end of the bed and is weighted sufficiently (with  $\frac{1}{2}$  to 1 kgm of weight) to exert continuous traction.

The cases of 14 patients are reported, 8 were primiparas and 6 multiparas, 5 were non infected and 9 infected. 5 were delivered spontaneously and 9 artificially, 12 experienced asfenebri puerperia. There were 12 living children and 2 stillborn. The "bite" of the forceps healed primarily in 10 and secondarily in 4. The average age of the patients was thirty five years. Labor had lasted an average of sixty three hours and had varied from thirty six to one hundred and twenty four hours before the application of the forceps. After the forceps were applied the labors were terminated within an average of three and one half hours, the time varying from one and one fourth to thirteen hours.

The average size of the os when the forceps were applied was from 4 to 5 cm, the extremes being 2 and 8 cm. Pronounced uterine atony was present in all 14 cases and in all cases other methods had been tried first with transitory effects only. No mention is made of the individual head positions. Four cases and an additional case in which the forceps were applied to the breech with a successful result are reported in detail.

Reports of the use of this method by two other observers are given, one was von Pall the other Pannke. The former has used the method 60 times 24 in the period of dilatation, 10 in the expulsion period and 26 prophylactically (cases in which he wished to hasten delivery because of a complicating condition). Pannke has used the method 20 times with satisfactory results. DANIEL G. MORTON, M.D.

## PUERPERIUM AND ITS COMPLICATIONS

Reich A. M. A Critical Analysis of Blood Loss Following Delivery. *Am J Obst & Gynec* 1939 37 224

An accurate collection and measurement of all blood loss, not only during the third stage of labor but for the necessary period of time thereafter should be established on all obstetrical services.

Hemorrhages from lacerations in the parturient canal are often undiagnosed. The incidence and the amounts lost may be high.

Greater consideration should be given to the conduct and management of the third stage.

Post partum hemorrhage from the normally situated placental site due to imperfect contraction of the uterus is the chief theoretical indication for an oxytocic. Hemorrhages of this origin are responsible for about 70 per cent of the cases of excessive blood loss incidental to delivery.

In a series of 588 patients treated by the administration of ergotrate after the delivery of the placenta the incidence of a blood loss of 500 c.c., or over was 7.1 per cent as compared with an incidence of 16.1 per cent in 548 cases in which ergotamine tartrate was given instead. When only the blood

loss after the third stage is considered, the incidence was 1.5 per cent in the ergotrate series and 11.3 per cent in the control series.

Clinical observation indicates a profound tetanic contraction of the uterus with immediate separation of the placenta if it is still within the uterus within forty five seconds of the intravenous administration of ergotrate. The use of the drug in 2,500 cases has been accompanied by no systemic reactions. The only complication that has been observed is the occasional retention of the placenta within a tightly contracted uterus when the drug is given at the beginning of the third stage.

Ergotrate is superior to other oxytocics in the speed, completeness and duration of its action and it has a definite place in the prophylaxis and control of hemorrhage from the normally situated placental site.

Puerperal infection and other morbid processes are materially influenced and dependent on the occurrence of large blood losses. The cell volume should be restored promptly to a normal amount by the use of transfusions in sufficient amounts.

EDWARD L. CORNELL, M.D.

Beecham C. T. Post Partum Hemorrhage as a Cause of Death. *Am J Obst & Gynec* 1939 37 258

The purpose of this study was to analyze the cause of post partum hemorrhage and details of various methods of treatment as shown by the records of 52 deaths from post partum hemorrhage in the 183,384 deliveries in Philadelphia during the six year period from 1931 through 1936. The Maternal Welfare Committee of the Philadelphia County Medical Society judged 32 (61.5 per cent) of these deaths as preventable. The responsibility for 28 deaths (53 per cent) was assigned to the attendant, as treatment in all was deficient. Four (7.5 per cent) of the fatalities were due to ignorance of the patients while 20 (38 per cent) were termed non preventable. Forty one (79 per cent) patients in this series were delivered in hospitals while 4 (7.6 per cent) of those delivered at home were taken to the hospital after the complication had developed.

The incidence of spontaneous delivery in this series of cases with post partum hemorrhage was 42.3 per cent the average incidence is 72 per cent. The incidence of version (15.4 per cent) in this series was ten times as high as the average incidence of version (1.52 per cent) in the hospital deliveries of Philadelphia in the first three years of this study.

The average time between delivery and death of the mother from hemorrhage was five hours and twenty minutes, yet only one half of the women were packed and less than one third had blood transfusions. Very few cases indicated anything but a haphazard plan of treatment. Accepted steps in the treatment of post partum hemorrhage are outlined all of which are within the scope of any modern hospital and staff.

EDWARD L. CORNELL, M.D.

Kahanpää V Early and Late Puerperal Morbidity Especially Following the Retention of the Fetal Membranes and the Placenta or Remains of the Same (Ueber Frueh und Spaet puerperale Morbiditaet insbesondere nach Retention von Fibaeten und Placenta oder Resten Der selben) *Acta Soc med Fennicae Duodecim* 1938 Ser B 25 Fasc 3

The aim of the author is to throw some light on the total puerperal inflammatory morbidity. Even the very slightest early puerperal disturbances were carefully studied in this regard and follow up investigations and examinations were carried out to determine the condition of the women after their discharge from the hospital. The interest in the examination centered upon the different complications of the puerperal period and special attention was paid to the retention of fetal membranes which are generally considered insignificant.

The clinical material included 5084 timely and premature births through the natural passages. In this investigation a morbidity scale was used which was based upon both the different grades of fever and other symptoms. The slightest grade of disease was taken to be the group of lochia putrida in which only a foul smelling lochia is a sign of puerperal morbidity. The follow up investigations were done on 1000 deliveries. The material for the follow up examinations consisted of 738 of these cases in which a gynecological examination was made on an average of five and five tenths years after the corresponding delivery. All the conclusions drawn from these findings were certified with the aid of mathematical statistical probability calculations.

The frequency of retention of the fetal membranes proved to be relatively low, namely  $2.5 \pm 0.2$  per cent. The cases of non operative retention also showed a high early puerperal morbidity  $7.6 \pm 2.3$  per cent,  $26.5 \pm 3.8$  per cent and  $52.3 \pm 4.4$  per cent according to whether the morbidity was calculated on the basis of the more or less severe cases of endometritis or whether the cases of lochia putrida were also included. The morbidity of the control material that is in cases without the complication of retention of the fetal membranes amounted to  $0.8 \pm 0.2$  per cent,  $4.0 \pm 0.5$  per cent and  $13.4 \pm 0.9$  per cent.

The cases of retention of placental tissues (71) by their frequency, morbidity and mortality values support the therapeutic principles of Zangemeister. In order that the late retentions associated with a bad prognosis may be avoided, the uterine cavity should be explored immediately after delivery in all cases including even those in which retention is barely suspected. An average of thirteen days elapsed up to the time of the hemorrhage that indicated the exploration in the puerperium which is a longer time than is generally reported.

The material includes 355 cases of manual separation, the frequency of which was  $0.99 \pm 0.05$  per cent. The number of fatalities was 16, the total mortality therefore amounting to  $4.5 \pm 1.1$  per cent. If

the patients who died from other causes than the retention (8) from hemorrhage as a result of delayed manual separation (4) and from criminal abortion (1) are not included, the true mortality from manual separation amounts to  $0.8 \pm 0.5$  per cent. This material is also classified with regard to retention of the fetal membranes following separation of the placenta. It was found that this additional complication considerably increases the morbidity of the cases of manual separation, in fact it causes more morbidity than any other intervention made in connection with retention.

The follow up examinations showed that even in cases in which the labor and early puerperium ran a perfectly normal course, late morbidity occurred in spontaneous births with completely expelled placentas and absolutely asymptomatic early puerperiums, the late morbidity amounted to about 4 per cent. In the group lochia putrida the late morbidity was considerably higher ( $17 \pm 3.4$  per cent) and approached that of the cases of true endometritis ( $24 \pm 5.3$  per cent). In the cases of retention of the fetal membrane the late morbidity was also high, but in the cases of manual separation they were lower than could be expected. It appears that follow up investigations alone generally did not suffice to definitely show a post partum inflammation of the genitalia, but that an objective follow up examination was necessary.

The early and late morbidity of the cases of retention of the fetal membranes compels us to take this complication seriously. The prophylaxis, namely the proper management of the puerperal period, must become more effective. In addition, an effort should be made to find the least harmless remedy for the removal of the remains of fetal membranes immediately after the delivery. We should abandon the overvaluation of the danger of manual separation in order that this intervention may be made early enough in the therapeutic program, especially in cases of hemorrhage. The high late morbidity in the cases of lochia putrida show that a foul smelling lochia in the early puerperium usually shows the presence of a true inflammatory process in the uterine mucosa, even in the absence of fever. In these cases the hospital treatment must be prolonged and suitable after treatment must be given. All parturient women should be examined a few months after the delivery so that diseases appearing later can be properly treated in time and the resulting prolonged or remaining inflammations with all their serious results can be diminished.

LOUIS NEUWELT M.D.

Balard P Personal Experience with Puerperal Peritonitis (Mon expérience personnelle des péritonites puerpérales) *Re franç de gynéc et d obst* 1939 34 18

In the twenty five years in which Balard has been in practice there has been a definite improvement in the diagnosis and treatment of puerperal peritonitis. In most of the 28 cases treated between 1934 and

1938 operation was done within the first few days after the development of symptoms. Only 1 patient was not operated upon, this patient was admitted to the hospital *in extremis* and died shortly afterwards; however, another patient, also admitted *in extremis* was operated upon and recovered.

Of the 28 cases of puerperal peritonitis reported 16 occurred after abortion, the remaining 12 after delivery at term. At operation an incision was made in the lower portion of the abdomen and drainage was established in most of the author's cases a Mikulicz drain was used. While hysterectomy may appear to be a logical procedure in these cases, Balard is of the opinion that it involves too great a shock and is attended with a high mortality. Hysterectomy was done in only 1 of his cases, and the patient died. Of the 16 patients in whom peritonitis developed following abortion, 12 died and 4 recovered. Of the 12 patients in whom peritonitis developed following delivery at term, 6 died and 6 recovered. The cases of peritonitis developing after abortion were of a more severe type than those developing after delivery at term, and the peritonitis was more frequently secondary to a septicemia than due to direct extension from the infected uterus. In cases of abortion of the criminal type also, the patient is less likely to be under constant medical supervision and the diagnosis of peritonitis is not made promptly.

In 20 cases in which bacteriological examination was made the streptococcus was the organism most frequently found. In 7 cases the non hemolytic streptococcus, and in 6 cases the hemolytic streptococcus was found, in 3 cases the streptococcus was associated with other organisms.

ALICE M MEYERS

## NEWBORN

Reuss A von. On the Pathology of Newborn Infants (Zur Pathologie des Neugeborenen) *Arch f Gynaek*, 1938 166 426

Infant mortality is today, according to von Reuss primarily a problem of early death due to a series of physiological peculiarities of the infants. To these

belong the allergies, of which the most frequent expression is called erythema toxicum neonatorum. Recurrent exanthema is considered an early sign of an exudative diathesis. Von Reuss also interprets certain types of melena disease or enterospastic conditions as expressions of allergy. Icterus gravis is nothing but a somewhat pathologically heightened icterus neonatorum. A palpable spleen and numerous erythroblasts in the blood stream suggest unfavorable prognoses. Therapeutically, blood transfusions are superior to other methods of management. A dehydration beyond the normal physiological weight loss is often expressed in a flaccid, wasted appearance, apathy, and less often, in a restlessness. This condition requires compensation for the fluid loss. The author recommends the administration of tea and Ringer's solution in equal parts with the addition of from 5 to 10 per cent sugar. By means of this treatment the water retention is improved and acetoneuria and hypoglycemia are prevented.

The diagnosis of "tetany" can only be made in an infant when there is a lowering of the serum calcium, an increase in the serum phosphorus, and an alkalosis. The typical melena neonatorum has nothing to do with sepsis, the best therapeutics is a blood transfusion. Von Reuss emphasizes especially that from 50 to 100 c cm of blood must be transfused into a hard vein as the popular method of injecting small amounts of blood, from 15 to 20 c cm, into the longitudinal sinus is usually without result. The great sensitivity of the skin and the high degree of contagion in pemphigoid diseases are pointed out. The most malignant form of the latter is exfoliative dermatitis. Fortunately, congenital lues is implied to be on the decline. For its eradication examination and treatment of all pregnancies during the first months are necessary. If a woman is found to give a positive reaction to the serum test during the puerperium prophylactic antiluetic treatment of the child must be undertaken.

In conclusion, the author points out the importance of adequate care of premature children, especially of the maintenance of a constant temperature (von Jaschke) RONALD R. GREENE M.D.





operation unless metastatic nodules can be felt in the liver or demonstrated roentgenologically in the lungs or in the sternum. These are the usual sites of metastases from adrenocortical tumors.

The cytological picture may be that of adenoma or hyperplasia of the adrenal cortex, and the majority of the tumors seem to originate in the zona fasciculata. The predominant cell type is of large polyhedral shape.

The term 'hypernephroma' is used frequently in characterizing this tumor. Although this designation is correct, the phrase "tumor of the adrenal cortex" would be more accurate and less susceptible to misunderstanding.

From a clinical standpoint it seems almost inevitable that some of the other endocrine glands must be involved secondarily. An antagonistic effect on the ovaries is inescapable. Stimulation of the anterior pituitary gland and, perhaps, the thyroid, is suggested by the relative tallness and advanced ossification of these patients for their age. The autopsy reports, however, yield very fragmentary and insignificant information concerning pathological alterations in the other parts of the endocrine system. The pituitary body was said to be normal in 2 cases and an eosinophilic adenoma, a colloid cyst and atrophy, and cystic hypoplasia, respectively, were found in 1 case each. It is difficult to interpret these findings, especially in view of the intimate functional relationship between the adenohypophysis and the adrenal cortex. No pathological changes were found in the thyroid gland. The ovaries were considered normal in 2 cases, and infantile in 1 case and the authors described them as progeric. The pineal gland was enlarged in 1 case. Far more thorough and elaborate studies of the ductless glands are necessary in future autopsies before any reliable conclusions can be formed as to the secondary effects of these tumors of the adrenal cortex.

From a technical standpoint adrenalectomy on the right side is more difficult than on the left because of the shorter pedicle of blood vessels. The right adrenal body lies very close to the inferior vena cava. In 7 of the 10 cases which were successfully operated on, an adrenal tumor was removed from the left gland, in 3 cases partial bilateral adrenalectomy was performed for bilateral suprarenal hyperplasia. The 3 aberrant adrenal tumors which were successfully removed presented a simpler technical problem (2 of these involved the left ovary, and 1 the right). In contrast it is interesting to note that in 6 of the 10 cases in which the patients died shortly after operation the tumor was situated in the right adrenal gland. These fatalities, however, were not ascribed to loss of blood.

When the diagnosis is definite and the side to be operated upon is known, the direct retroperitoneal approach for the lumbar incision (in common use in renal surgery) is most satisfactory. Free division of the costovertebral ligament permits easy retraction of the twelfth rib, resection of which is then unnecessary. After the upper pole of the kidney is

freed this organ can be pushed down out of the way and the adrenal area is then fully exposed. The technique used in the freeing of the adrenal tumor (which is usually well encapsulated) is very similar to that followed in surgery of the kidney: blunt dissection, clamping, and ligation of the pedicle.

When there is doubt regarding the side to be operated on or bilateral involvement is suspected an operative procedure which will permit exposure of both adrenal areas at once is far superior to a two-stage operation, whether it is performed at the same time or at different times. If neither adrenal body shows a definite tumor it may be advisable to resect portions of both glands, and the extent to which the resection should be carried is more accurately determined if both glands have been inspected before the resection of either. Bilateral exposure through a midline abdominal incision is simple and satisfactory, but subsequent procedures—either partial resection or total adrenalectomy—are more difficult than if exposure is made retroperitoneally. For this reason the use of right and left lumbar incisions, with the patient flat on the abdomen, has advantages. This position was formerly used for bilateral nephropexy and was often preferred even for unilateral surgery by Kidd. Recently it was used by Young in 3 cases of partial bilateral resection. When bilateral inspection through these lumbar incisions reveals a tumor of one adrenal body, and the other is normal the patient can be placed in the kidney position for retroperitoneal removal of the involved gland, if desired.

ELMER HESS, M.D.

Levy S. E. and Blalock A. A Method for Transplanting the Adrenal Gland of the Dog with Reestablishment of Its Blood Supply. *Ann Surg.* 1939 109 84.

Prompted by a determination to study the effect of removal of one adrenal gland and denervation of the remaining one on experimental hypertension due to renal ischemia the authors describe and submit their findings in transplantation of the adrenal gland to the neck in dogs. It is stated that search of the literature reveals no instances in which the gland has been transplanted *in toto* with the reestablishment of its blood supply by suture of the blood vessels.

Transplantation of the adrenal gland to the neck of dogs it was felt, offered certain advantages in subsequent studies: it represented a denervated preparation, the venous return was through the external jugular vein which is located just beneath the skin and can be punctured without difficulty, and the superficial position of the gland made it readily accessible for roentgen treatment, removal under local anesthesia, or for other procedures.

Finding that the blood vessels of the adrenal gland were too small for anastomosis by suture, the renal artery and vein of the adjacent kidney were utilized as conductors of blood to and from the transplant. The kidney and adrenal gland were transplanted *en masse*, the renal artery being anastomosed to the carotid artery, the renal vein to the external jugular

vein and the kidney removed at a later date. Large mature dogs were used in all experiments and the length of time that the transplanted tissues were completely deprived of their circulation varied from twenty nine to forty two minutes in the different experiments. The operative technique is presented in detail as it was applied to 14 subjects. Seven failures were ascribed to thrombosis of the vessel, necrosis and infection of the tissues of the neck, distemper, secondary hemorrhage or to adrenal insufficiency.

Observations were made on the remaining 7 dogs which have lived for a number of months with a single adrenal gland located beneath the skin of the neck. Such animals maintained their weights played and fought as do normal dogs. One became pregnant and gave birth to a normal puppy. Evidence that the transplanted gland begins to function at an early date was found in an experiment in which the right adrenal gland was removed thirteen days prior to transplantation of the left one. Evidence that the transplant will live when the second adrenal gland has not been removed was suggested by experiments in which transplantation of the left adrenal gland preceded the removal of the right one by one month.

The arteriovenous difference in oxygen of the transplant was exceedingly small while tests for epinephrine revealed no unequivocal inhibition of the intestinal strip by venous blood from the transplant. The survival period of the one animal in which the transplant was removed for determination of the latter point was less than five days. Four transplants which have been removed and examined appeared normal grossly and microscopically including the cortex medulla and surrounding ganglia. Only unmyelinated fibers were present in the transplanted adrenal gland, and material removed at autopsy from the region of the usual location of the glands did not reveal accessory adrenal tissue.

ARTHUR H. MILBERT, M.D.

Marion G. Atrophic Kidneys (Reins atrophique)  
*J. durol med et chir.* 1939 47 5

Marion defines an atrophic kidney as one in which the renal mass is much reduced as compared with the normal as a rule the anatomical characteristics of such a kidney are abnormal with resultant marked reduction in function. Atrophy of the kidneys may be either congenital or acquired, the latter is more frequent.

Congenital atrophy of the kidney is a true malformation similar to that of complete absence of the kidney, both result from an embryological arrest of development. Such congenitally atrophic kidneys are of various forms and sizes. In 1 patient recently operated on for infection and suppuration of the ureter, a nodule the size of a pea was found at the upper end of the ureter, histologically it consisted of renal tubules, the embryological origin of which is the same as that of the ureter. In another case of a large hydronephrosis the walls of the renal pelvis and dilated calyces were very fibrous, at one point a small thickened mass was found which consisted

of normal renal tissue. In 1 case in which the urine from one kidney was much less in amount and more highly concentrated than that from the other kidney, the affected kidney at operation was found to be a kidney in miniature, much smaller than normal in size but of normal form and structure except that the pelvis was a small pocket with only two small calyces. Another variety of congenital atrophic kidney is that seen with a double kidney in which the upper kidney is often atrophic with a poorly developed pelvis. It is the abnormality in the renal pelvis which distinguishes congenital from acquired atrophy of the kidney. In congenital atrophy the pelvis and calyces are never normally developed, either they are reduced in size or the calyces are reduced in number. The renal parenchyma in congenital atrophy may be entirely normal or partially normal and partially fibrous, it may show only the secretory tubules and no glomeruli or it may be the site of inflammatory processes.

Acquired atrophy of the kidney is usually due to infection. The infection may be an uncomplicated pyelonephritis but as a rule this is associated with the presence of a calculus. Tuberculo does not produce atrophy of the kidney unless there is some associated infection. Infarction may also cause atrophy of the kidney. Acquired atrophy of the kidney is usually total but it may be partial. In total atrophy not only is the organ diminished in size but its surface is irregular, the parenchyma is diminished in thickness but the pelvis is usually normal or slightly dilated. Histological examination shows that the inflammatory lesions resulting from the infection tend to become sclerotic with destruction of the typical elements of the renal parenchyma. In 1 atrophic kidney resulting from subacute pyelonephritis the glomeruli were largely transformed into fibrous bands, the tubules being relatively less involved while in another atrophic kidney associated with calculus the tubules were largely obliterated by hyaline substance, the glomeruli being less involved, in a third case both tubules and glomeruli were markedly altered.

In some cases the presence of an atrophic kidney may cause no symptoms. Usually however symptoms are present but they are not characteristic. One of the most frequent symptoms is pain of the type of renal colic. The urine is usually purulent, occasionally there may be blood in the urine. The history usually shows evidence of a chronic pyelonephritis or of a calculus (sometimes an operation has been performed for calculus). Sometimes the roentgenogram shows the presence of a calculus and when the patient comes to operation the renal atrophy is discovered and nephrectomy is done. In other cases ureteral catheterization and the analysis of the separate urines shows that the urine from the affected kidney is less in amount and the urea concentration is diminished, the phenolsulfonphthalein excretion is also diminished as compared with that of the opposite kidney. If with these findings the pyelogram shows a normal renal pelvis or an ab-

normally small pelvis with diminution in the number of calyces one may make the diagnosis of renal atrophy, either acquired or congenital, depending on the appearance of the pelvis. The only case in which the renal pelvis shows any abnormality in the pyelogram of an atrophic kidney of the acquired type is that in which a nephrostomy has been done previously for removal of a large calculus.

Renal atrophy is not a serious condition *per se*, but it may have serious consequences if the opposite kidney becomes the site of a lesion that would require nephrectomy such as tuberculosis or tumor or if an operation is indicated which would suppress the function of the opposite kidney for a time such as nephrostomy for calculus. When renal atrophy produces symptoms the atrophied kidney should be removed if it causes no symptoms and is discovered only incidentally nephrectomy is not necessary.

ALICE M. MEYERS

#### Higgins C C Squamous Cell Carcinoma of the Renal Pelvis *Arch Surg* 1939 38-25

Five cases of squamous cell carcinoma of the renal pelvis, seen at the Cleveland Clinic, are added to 59 already noted in the literature. Difficulty is encountered in the analysis of these cases because of the varied terminology used to describe the pathological picture. Complete reports are given of these 5 cases.

From an etiological standpoint, one finds that renal calculi long continued chronic inflammation and leucoplakia are the predominating precursors of squamous cell carcinoma of the renal pelvis. Of interest are the epithelial changes reported by Wolbach and also by the author occurring in the presence of Vitamin A deficiency. In rats and guinea pigs it was noted that the epithelium of various organs including those of the urinary tract was replaced by a stratified keratinizing type similar to or comparable with leucoplakia.

In the majority of the reported cases the lesion occurred in patients in the fifth decade of life, the average age being fifty six years. In the present series the ages were forty one, fifty two, fifty one, forty nine and fifty eight years. Of the 64 patients whose cases were reported 36 were males and 28 were females. The site of predilection of the tumor was about evenly divided between the right and left sides in the collected series while in the present series the right kidney contained the tumor in 4 instances and the left kidney in 1.

No definite symptoms are pathognomonic of the condition and often the symptoms are referable to a coexisting calculus. While it has been said that hematuria rarely occurs with this type of tumor because of its relative avascularity Higgins noted hematuria in all 5 of his cases. Each of his patients manifested pyuria with its associated symptoms. Loss of weight is a late manifestation occurring after metastases have developed.

While early diagnosis is essential it may be difficult even when all available facilities are employed

The condition must be differentiated from tumor involving the renal parenchyma from non opaque calculi in the renal pelvis and from early renal tuberculosis. Pyelography is the most important means of establishing a diagnosis, but the filling defect must be differentiated from that produced by calculus or tuberculosis. Occasionally, the presence of a calculus may mask the true condition.

The most common coexisting pathological conditions are leucoplakia and renal calculi. A chronic inflammatory process is often present and hydro-nephrosis and pyonephrosis have also been noted in several instances. Two types of lesion predominate: (1) lesions in which the tumor cells invade the renal parenchyma early and eventually replace it, (2) lesions confined chiefly to the renal pelvis, often taking on a papillary appearance and causing ureteropelvic obstruction. Metastases occur early and are widespread, dissemination through the blood stream being evidenced by lesions in the lungs, liver and bones and also by lymphatic extension to the regional lymphatic glands.

Early diagnosis, followed by nephrectomy, is the procedure of choice. In the present series no reduction in the size of the tumor was noted following pre-operative high voltage roentgen therapy. Post-operative roentgen ray therapy is advisable. Diagnosis is frequently not established until late in the course of the disease, and metastases may be present when the patient first consults the physician.

The prognosis is grave because of the frequency of metastasis. In a review of the literature, the author was unable to find the report of a patient who was free from metastases at the end of five years. Kretschmer reporting on 30 instances of operative intervention noted an operative mortality of 53 per cent. The average duration of life was seven months and fifteen days. In this series, 1 patient died from bronchopneumonia twenty eight days after operation, a second died five months after operation with metastases in the lungs, the third died from generalized metastases one month after operation, the fourth patient is living and well three years and eight months after operation with no evidence of metastasis and the fifth patient died of metastases two years and nine months after operation.

ARTHUR H. MILBERT, M.D.

#### GENITAL ORGANS

Fèvre M and Eck R A Clinical and Therapeutic Study of Ectopia of the Testicles (*Étude clinique et thérapeutique de l'ectopie testiculaire*) *Ann. méd. chir. Par.*, 1938, 3: 339

Fèvre and Eck note that ectopia testis may be unilateral or bilateral (monorchidism or cryptorchidism). The appearance of the scrotum usually draws the attention of the parents to the abnormality. Diagnosis is made by careful palpation of the iliac fossa and along the inguinal canal with the child lying down. Palpation is done gently and slowly with the fingers pointed downward along the ingui-

nal canal. The testicle is often felt as a small mobile mass sensitive to pressure in the inguinal canal and it may be possible to push it down outside of the canal. Sometimes the testicle may be fixed in the inguinal canal; such testicles are always small, often soft and usually very sensitive. If the testicle is not found in the inguinal canal, the neighboring regions should be carefully palpated. The testicle may be absent but in some cases even when not palpable, it may be small and situated deep in the iliac region.

Some boys with ectopia testis appear otherwise normal both physically and mentally, but others show definite symptoms of glandular deficiency and sometimes exhibit the adiposogenital syndrome. As the subject reaches puberty and manhood the ectopia is often the cause of feelings of inferiority, sexual inhibition and neurasthenia. Some men with ectopia testis are sexually potent, but others are impotent and show typical signs of eunuchism.

In the treatment of ectopia testis it is important to determine the degree of mobility of the testicle. If the testicle is so mobile that it can be easily pushed down into the scrotum, it usually comes down normally as the boy develops without special treatment. If it is mobile but cannot be pushed out of the inguinal canal, medical treatment is of benefit. If the testicle is fixed or outside of the inguinal canal or is associated with a hernia, operation is indicated. Operation is also indicated if the testicle cannot be found by palpation. It is essential that the testicles be brought down into the scrotum before the age of puberty so that their normal function may be maintained.

Medical treatment consists in the administration of gonadotropic hormone (from the anterior lobe of the hypophysis) or the male sex hormone. Lereboullet has used thymus extract with good results, but the gonadotropic or male sex hormones are more often employed. The former may be associated with thymus extract. Hormone treatment should be begun early so that if it fails after a fair trial, there is still time for operation to be done before the age of puberty. Hormone therapy has undoubtedly given good results in many cases with palpable and mobile ectopic testicles. When the testicle cannot be palpated, it may cause enlargement and descent.

Operation should be done between the ages of six and twelve years if the testicle is mobile; hormone therapy should first be tried and operation done later. However, if the testicle is fixed and soft, shows evidence of atrophy by compression or is painful, operation should be done at the age of six or seven years. The transscrotal procedure of Ombredanne is employed by the authors. In 84.5 per cent of 117 cases in which operation was performed with re-examination at intervals of from several months to several years after operation, they found the testicles well descended and in good position in 85 per cent; the descent was not complete in another 2.5 per cent in which there was bilateral ectopia; one testicle had failed to descend or was atrophied. In 2.5 per cent the results were poor and in 2 cases the results

were not definitely established. After successful operation it was found that the testicles reached normal size and development even if they showed definite hypoplasia at the time of operation. In about one third of the cases there was a definite improvement in the growth of the body and in the general physical and mental condition after operation. MacCollum of Boston, Wangersteen and more recently J. Schultz have published statistics showing that men who were successfully operated upon for ectopia testis before puberty are fertile in a considerable percentage of cases.

ALICE M. MEYERS

## MISCELLANEOUS

Vest S, Hill J H and Colston J A C. Experimental and Clinical Observations on Sulfanilamide in Urinary Infections. *J Urol* 1939 41: 31

The authors have carried on an investigation of the antibacterial effects of known amounts of sulfanilamide upon graduated numbers of certain of the bacteria of significance in urinary infections. They learned that sulfanilamide was a most potent antibacterial agent and that it was of value in cases in which mandelic acid proved unsuccessful. They concluded that this drug had a definite bactericidal action in urine infected with staphylococcus aureus, escherichia coli, aerobacter and proteus.

This bactericidal action is not demonstrable in large numbers of these organisms.

It may be regularly demonstrated when the number of organisms is reduced to from 100 to 400 organisms per c.c.m., the number depending on the genus, except when the organism is the aerobacter, which is known to be more resistant than the other organisms here studied.

The greatest reduction occurs within the first eight hours after which if sterilization is not complete an increase may occur.

The direct action of sulfanilamide in urine therefore follows closely the laws applicable to other directly antibacterial agents in that (a) the action increases directly with the dosage of the drug, (b) the action varies inversely with the number of organisms present, (c) aerobacter is more resistant *in vitro* than the other organisms studied.

The use of sulfanilamide in a series of cases such as those encountered on the surgical urological service has been discussed. The incidence of organisms present before and after treatment with moderate doses of sulfanilamide is given.

The clinical result following the use of sulfanilamide in moderate doses is in proportion with consideration of the organism encountered to the complicating factors. Single infections are more readily sterilized than mixed infections.

Compared with the use of mandelic acid in a similar series of cases, sulfanilamide is a more potent urinary antiseptic even when used in moderate dosages and even though frequently discontinued because of disagreeable symptoms.

Sulfanilamide is one of the most potent and practical urinary antiseptics that has been introduced. We believe, however, that it should not be used indiscriminately and that in cases infected with certain types of organisms other therapeutic agents are preferable.

J. SYDNEY RITTER, M.D.

J SYDNEY RITTER M D

O Crowley C R James W L, and Sutton H L  
Sulfanilyl Sulfanilamide in the Treatment of  
Gonorrhea in the Male *J Urol* 1930 41 51

Following the work of Gray, Rosenthal and Barlow, in which they reported that sulfanilic sulfanilamide given by mouth was one half as toxic as and slightly more effective against streptococcal infections in mice than sulfanilamide, the authors made a clinical study of gonococcal infections in man using the related compound for therapy.

A group of 85 patients were established on a routine of 45 gr of sulfanilal sulfanilamide daily and treatment was continued until both glasses of urine had been clear for four days, unless the total amount of drug given was more than 500 gr. when it was discontinued with few exceptions. At this point provocative tests were made and if a recurrence occurred within a period of several weeks, the patient was discharged as cured. Ninety four per cent of the patients were reported as clinically cured in an average of ten days. Seven per cent showed some reaction to the drug but in no case was it serious. The drug in the authors' hands seemed equally effective in old and new cases being 50 per cent more effective and 50 per cent less toxic than sulfanilamide and an extremely low proportion of complications (1 per cent) and no recurrences were encountered.

D E MURRAY M D

Batchelor R C L Lees R Murrell M and  
Braine G I H 2 Sulfanilyl Aminopyridine  
(M & B 693) in the Treatment of Gonorrhea  
*Brit J J*, 1938 2 1142

The authors present a preliminary report of 102 cases of gonococcal infection treated with M & B

693 in which the standard of cure the general results of treatment and the management of a case are given. They conclude from their work that a high proportion of apparent cures can be obtained in a large majority of cases (91 per cent), they may be of short or long duration, and occur in men or in women. The complications such as epididymitis, arthritis, or iritis present in many of the cases when first seen improve rapidly. In the cases reported there was complete absence of complications or spread of the disease after the start of drug therapy without irrigation or other adjuvant treatments. Toxic symptoms occurred in less than one third of the cases in which recovery was quickly made and no lasting ill effects were encountered. When normal dosage was employed the toxic effects were usually mild and required only a reduction of the dose. As a result of their experience the authors are led to conclude that M & B 693 is the most potent antgonococcal agent available at the present time.

D C MURRAY MD

D L MURRAY M D

Winkle C H The Treatment of Gonorrhea with Uleron a Review of 120 Male Cases *Brit M J* 1939 I 57

The author reviews 120 cases of neisserian infection treated with uleron which is apparently a sulfanilamide compound. He concluded that this drug gave excellent results.

He reported cures in 74 per cent of the patients who had received no other treatment and had reported in the early stages of the infection. Of a second group of 20 patients who had received treatment and resisted the ordinary forms of medication 5 or 25 per cent did not respond to treatment. The reaction from this drug, although 12 gr. of the drug were given over a period of three days was not alarming. Three patients complained of a slight headache and 4 of slight nausea. Two patients developed a generalized urticaria which disappeared entirely after one week's cessation of the drug.

I SYDNEY RITTE R. M.D.



# SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

## CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

**Peycelon R** Metastatic Staphylococcal Bony Suppurations in the Clinical Course of Furuncles and Anthrax in the Adult (À propos des suppurations osseuses métastatiques à staphylocoques au cours de l'évolution des furoncles et des anthrax chez l'adulte) *Rev d'orthop* 1939 26 33

Metastatic staphylococcal bone infections in the adult are relatively rare. These metastatic lesions have their primary focus ordinarily in acute pulmonary pathology, felons or furuncles of the skin. Metastatic osteomyelitis is characterized by localization in the long bones and in the adult it lodges in the middle of the diaphysis while in the adolescent it localizes close to the epiphysis.

Three groups of anatomicoclinical forms are described: (1) acute osteomyelitis involving all the layers of the bone from the periosteum to the medullary cavity; (2) subacute cortical diaphyseal osteitis (this type is represented by destruction in one point of the diaphysis of very limited depth and independent of the central diaphyseal canal. To this is added a reactionary periosteal swelling. This type of lesion frequently causes difficulty in differentiation from bone syphilis or bone sarcoma); (3) a type of metastatic periostitis which is more than a true osteitis and involves only the peripheral layer.

Six cases are described in detail, all of which gave a culture of pure staphylococcus. The bones involved in these cases were the femur (2), the tibia (2), the fibula (1), and the iliac bone (1).

The origin of the metastatic staphylococcus has been determined definitely in each of the 6 cases presented. In each case an injury to a long bone occurred during the course of a furuncle of the skin. The metastatic lesion followed and both the original and metastatic lesions were identified as being due to the same organism, the staphylococcus aureus.

RICHARD J BENNETT JR MD

**Milder G B and Morton J J** Pulsating Benign Giant Cell Tumors of Bone *Ann Surg* 1939 109 16

Pulsating giant cell tumors of bone are extremely rare. Only 4 cases that can be definitely identified as benign have been found in the American literature since 1900. There were no cases of this type reported in more than 300 benign giant cell tumors listed in the bone sarcoma registry of the American College of Surgeons.

The authors present in abstract form the 4 previously reported cases and report a fifth case in detail.

The patient was a white female, aged fifty-two. Laminectomy was performed in 1924 for swelling of the spinal cord in the upper thoracic region. Roent-

genotherapy enabled the patient to walk after two years.

In April 1935 the patient first noted tenderness in the left sacroiliac region. The pain became constant and was aggravated by walking. In April 1936 she noticed a swollen painful area. Two months before admission there were numbness and tingling in the feet. She experienced a crackling sensation at the site of the tumor.

Physical examination revealed a smooth, rounded, soft, fixed, non-tender mass in the left sacroiliac region measuring 8 cm in diameter. Pulsation in the mass was marked and was synchronous with the heart beat. A bruit was present. Egg shell crackling was easily demonstrated. Pyramidal tract signs were present bilaterally. Temperature, pulse and respirations were normal.

Röntgenological examination of the pelvis revealed an irregular shadow of increased density extending from the anterior end of the ilium to the posterior end. The ilium showed histologically a typical benign giant cell tumor. For therapy 3,300 roentgen units were given through 4 portals over a period of eighteen days. There was no noticeable effect on either the size or the pulsation of the tumor.

At the first operation the tumor was partially excised. At the second, further tumor tissue was removed, and at the third operation another attempt was made at excision. On two occasions radium was inserted. By this means a total of 660 mgm/hr were given. The tumor continued to pulsate.

At the fourth operation the left internal iliac artery was ligated, which resulted in the immediate cessation of the pulsation.

At the fifth and sixth operations the excision of the remainder of the tumor was accomplished. The total weight of the excised tumor was 400 gm. The operations were performed over a period of six months.

After operation the patient made an uneventful recovery and walked without difficulty. She left the hospital two hundred and thirty-seven days after admission. The cavity measured 8 by 8 by 6 cm.

In September 1937 the patient again noted some difficulty in walking. On November 6, 1937, being unable to walk and presenting urinary incontinence, she was hospitalized. Bilateral spasticity of the lower extremities was present. Sensation was found to be intact. The patient appeared to be mentally deranged.

Biopsy taken from the granulating tissue showed no histological evidence of neoplasia. Both upper extremities became spastic. Left lower facial palsy developed. The patient died two weeks later from a clinical intracranial lesion. Autopsy was refused.

RICHARD J BENNETT JR MD

Howard N J A New Concept of Tenosynovitis and the Pathology of Physiological Effort *Am J Surg* 1938 42 723

Crepitating peritendinitis is an acute pathological lesion resulting from the prolonged exertion of an accustomed muscular effort. The lesion is recognized by the appearance of pain or crepitation on motion of a particular part of an extremity.

The principal factors in its occurrence are trauma from direct violence plus the time interval of the trauma, increased use of the part plus the time element of the increased activity, especially upon return to a task after a prolonged lay off, the fatigue syndrome—weakness or cramps from prolonged use.

The pathological changes consist of edema of the peritendinous areolar tissue and muscle, particularly the muscle tendon junction. Thrombosis of the venules occur in these tissues. Deposits of fibrin in the areolar tissue and between muscle fibers are found to be the cause of the audible and palpable crepitation. The muscle fibers may undergo degenerative changes to the point of liquefactive necrosis within the sarcolemmic sheath. The areolar tissue and muscle both are found to have more acid reaction, when colorimetric hydrogen ion concentration studies are carried out. The individual muscle fibers lose their glycogen and such tissue extracts are found positive for lactic acid. Both grossly and microscopically the tendons are found unchanged. No tendon sheaths exist at the site of pain and swelling, and they cannot be involved in the pathological changes. The crepitating tendo vaginitis is a peritendinitis and myositis, the product of excessive fatigue of a definite muscle group and not of rheumatoid, infectious or toxic origin.

In a study of 72 cases of crepitating peritendinitis, it was found that 91 per cent occurred in males and 85 per cent in females. Thirty eight cases followed direct trauma and accustomed or usual work and activity. The interval between the direct trauma and the development of crepitating peritendinitis averaged three days. Thirty four patients gave no history and showed no evidence of direct trauma or sprain and all had either returned to work or sport hobbies after long inactivity or had unusual tasks or unaccustomed exertion assigned to them.

In physiological experiments fatigue of a muscle group is shown by a more or less complete loss of irritability and contractility brought on by functional activity. When complete fatigue occurs, a very long interval is necessary for recovery after this further efforts to contract the muscle greatly prolong the period of recovery. It is observed that most patients with crepitating peritendinitis complain of loss of power entirely apart from pain.

Treatment logically should be directed toward complete and absolute rest of the involved muscle group. Immobilization is accomplished by means of moulded plaster of Paris splints lightly reinforced by circular plaster. Immobilization of the wrist without inclusion of the thumb is inadequate even though the other fingers are left free.

Thirty four cases treated by complete plaster immobilization had an average disability period of eleven and six tenths days. Twenty five cases treated by straight board splints, with the thumb left free occasionally, had an average disability period of twenty two and six tenths days. If one chose from both groups cases in which immobilization was considered inadequate and was followed by physical therapy, the average disability period was forty five and one tenth days. Baking, massage, and diathermy have no place in the treatment of this lesion.

The time factor is important in the development of chronic lesions. The trauma consists of both the internal stresses from muscular exertion and the minor continuous external trauma associated with physical activity.

Subdeltoid bursitis is such a lesion. A W Meyer has repeatedly shown that attrition changes due to wear and tear are frequently present in the shoulder. This is true especially of the tendons that form the floor of the subdeltoid bursa. Barr in a review of pathological calcification defines dystrophic calcification as the deposits of lime salts in dead or dying tissue. Dystrophic calcification is dependent on local conditions only. According to Sanstrom and Wahlgren the dystrophic calcification of subdeltoid bursitis actually lies in the tendon and peritendon of the muscles attached to the greater tuberosity of the humerus and the author calls this peritendinitis calcarea. This is considered by Meyer to be dystrophic calcification in areas devitalized by attrition changes.

In the acute stage of this lesion, the author prefers to inject the bursa with from 15 to 20 c.c. of 1 per cent novocain and then gently manipulate the shoulder. In 18 cases so treated the average disability was four and seven tenths days. Comfort was maintained by the use of an arm sling and diathermy. In chronic cases this method was not very effective.

Occupational cramps found in writers, milkers, seamstresses and the like were considered dependent mainly upon the exhaustion phenomena in the interosseous and lumbrical muscles, and occasionally in the muscles of the thenar and hypothenar eminences.

F HAPOLD DOWNING, M.D.

Vernetti L. Plastic Operations on Tendons with Tubular Skin Flaps. Experimental Research (Plastiche tendinee con lembi cutanei tubulari. Ricerche sperimentali). *Clin chir* 1938 14 931

For his experiments on rabbits Vernetti used the long extensor tendon of the toe and the Achilles tendon. After careful shaving and disinfection of the leg two parallel incisions about 2.5 cm apart and perpendicular to the axis of the extremity, were made through the skin and the edges of the incisions were approximated with separate silk sutures over a thin iron wire so as to obtain a tubular skin flap with the epidermis inside the lumen of the tube. The tube was then separated from the skin by two longitudinal incisions close to the line of suture but was left attached to the subcutaneous tissue. With considera-



tion for the possible degree of retraction of the cutaneous tube a proportionate part of the selected tendon was rejected an individual catgut suture was passed through each end of the tendon and tied circularly round it and the tube was swung into the defect and its ends were sutured to the corresponding ends of the tendon by means of three catgut sutures passed through the tendon above its circular ligature. The fascia was reconstructed whenever possible and the line of skin suture was arranged so as not to be superimposed over the operated zone. This is easily obtainable by the construction of the tube at a slight distance from the tendon to be operated upon. The diameter of the tube must correspond to that of the tendon. Results of the intervention were verified fourteen nineteen thirty forty five and ninety days after the operation.

Macroscopically the tube was found to be recognizable from the surrounding tissues as a whitish cord of smooth and shining contour and of a consistency varying in hardness and fibrosity according to the time elapsed since the intervention. In old cases the consistency was about the same as that of the tendon. The tube was found detached from the tendon at one end in only two animals probably because of the thinness of the selected tendon. No adhesions to the tube were observed in any of the animal and all tubes were mobile. It seems that the loose subcutaneous tissue favors the sliding of the tube and prevents the formation of adhesions especially when the animals are allowed to move about from the beginning. However adhesions develop when the cutaneous suture line is superimposed on that of the tendon. The movements of the animals become normal from twenty to thirty days after the intervention.

Histologically the dermal tube retains its vitality owing to its loose connections with the subcutaneous tissues which continue to nourish it. The epidermic layer does not cause any disturbances becomes atrophied and finally disappears. The connective tissue of the derma becomes denser and its fibers assume a longitudinal direction after forty five days the elements of the derma are unrecognizable and the lumen of the tube has disappeared. The attachment of the tube to the tendon is ensured by newly formed connective tissue which surrounds the extremities of the two elements and becomes fibrous with a longitudinal arrangement of its individual fibers some of which penetrate between the elements of the tendon. No proliferation of the tendinous tissue has been observed. RICHARD KEMEL MD

**Vallet Guy P and Frieh P.** Para articular Calcifications of the Shoulder Tendinous Ruptures and Periscapular Bursitis (Calcifications para articulaires de l'épaule ruptures tendineuses et bursites périscapulaires) *Rev d'orthop* 1939 26 20

A summary of the literature on lesions of the shoulder joints for the past thirty years is presented. The majority of the original papers were presented by Codman Painter Bergmann and Stedea.

The pathology of the lesions as well as the pathological physiology of the calcifications are considered. The evolution of the calcareous deposits and the different locations in which they may occur are discussed. Roentgenologically the two shoulders with calcareous deposits may seem identical but pain may occur in only one. The poorness of the circulation at the site of these calcareous deposits at the musculotendinous junction may be responsible for the poor or absence of healing after spontaneous rupture or operative removal of the contents of these inflamed calcareous bursae.

From the clinical standpoint partial tendinous rupture and subsequent formation of a calcareous deposit are considered.

The first recommendation of treatment is that of immobilization in bed with the arm in abduction. Other methods of treatment are diathermy infrared rays and small doses of radiotherapy. It has been necessary to operate in many instances and the authors are of the opinion that the method of choice is local infiltration of novocain directly into the bursal sac as a painful region.

In the case seen by the authors pain had been present at the base of the right shoulder for six months increasing little by little in intensity until it became intolerable. A roentgenogram confirmed subacromial calcification. Radiotherapy was tried without success. Two local infiltrations of novocain were attempted with complete success. The roentgenograms taken several days after the infiltration showed the disappearance of the calcification.

Puncture alone or puncture with aspiration of these sacs has been known to give good results in some instances. It is not possible to cure all cases by this method. If this method fails the surgical method should be undertaken as a last resort. The operation is carried out under local anesthesia through a short vertical non mutilating incision. The functional results are best and complete at the end of from three to six weeks.

RICHARD J BENNETT JR MD

**Casuccio C.** Topography of the Sacro Iliac Joint and Its Clinical Importance (Topografia della sacro-iliaca e sua importanza clinica) *Chir d'organi da movimento* 1938 24 83

The ventral or anterior part of the sacro iliac joint may be divided into two portions a superior part lying in the greater pelvis and an inferior part lying in the lesser pelvis. The two parts meet at almost a right angle and in the adult are from 9 to 10 cm long (Fig 1). The superior part of the joint is covered by the belly of the psoas muscle which crosses it obliquely from above downward and from inward outward. Some fibers of the iliac muscle separate it from part of the joint. Through its fibers runs the crural nerve which is separated from the joint by a thin muscular sheet composed of fibers of the psoas and iliac muscles. The obturator nerve runs parallel to the internal margin of the psoas. It is formed from roots which originate from the second third

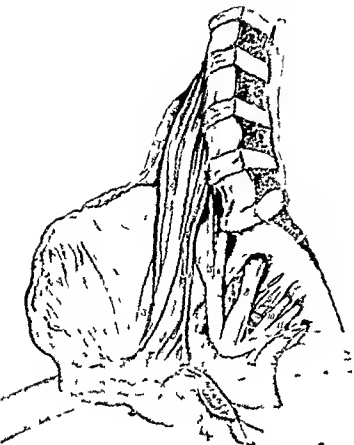


Fig 1. Right adult hemipelvis. The broken line indicates the ventral margin of the sacro iliac joint (1) ilio psoas (2) crural nerve (3) obturator nerve (4) fourth lumbar root (5) fifth lumbar root (6) gluteal artery (7) first sacral root (8) piriformis muscle (9) second sacral root (10) third sacral root (11) fourth sacral root

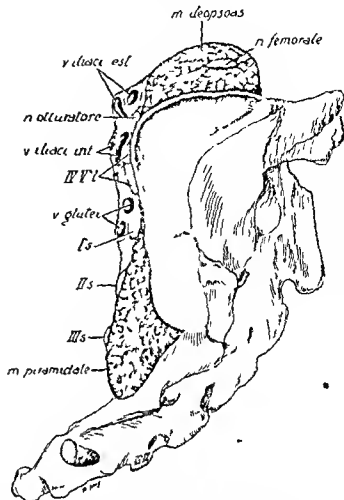


Fig 2. Drawing to show the topographical relations of the ventral margin of the sacro iliac joint

and fourth lumbar segments. Usually, about 7 cm from its point of origin the obturator nerve lies directly on the sacro iliac joint (Fig 2). A centimeter and a half caudad to the obturator nerve a thick flat ribbon (lumbosacral trunk) formed by the union of the roots of the fourth and fifth lumbar segments obliquely crosses the sacro iliac joint a little below the union of its upper and lower parts. The lumbosacral trunk is from 8 to 10 mm wide at this point and lies directly on the joint. More caudad between the fifth lumbar and first sacral roots are found the gluteal vessels which ordinarily make direct contact with the joint. The situation of these vessels, however, varies greatly. The relations between the first sacral root and the joint vary in different individuals. The root usually lies directly on the joint some times the gluteal vessels separate it from the joint and at other times the superior part of the piriformis muscle lies between it and the joint. The piriformis muscle covers the distal end of the lower section of the sacro iliac joint for about 3 cm. This muscle always separates the second sacral root from the inferior extremity of the joint.

Diseases of the sacro iliac joint are as numerous as diseases of other joints. Among these may be

mentioned tuberculosis, rheumatic and deforming arthritis, acute streptococci and staphylococci infections, neoplasms, arthritis of Malta fever, and osseous lymphogranulomatosis. Clinical diagnosis is difficult on account of the proximity of this joint to the lumbar vertebrae and hip joint. Arthritis of the sacro iliac joint may cause severe and wide spread symptoms or be asymptomatic. Roentgen ray evidence of a sacro iliac arthritis in a patient suffering from various related symptoms does not necessarily mean that this joint is the cause of the symptoms, the symptoms may have origin in the lumbar vertebrae or in the hip joint. The most common symptom of sacro iliac arthritis is pain, which varies greatly in intensity and distribution. Affection of the upper or cephalad part of the joint may involve the crural and obturator nerves and cause pain on the anterior and internal surfaces of the thigh while involvement of the lower part of the joint may cause sciatic pain. Limitation of movement of the hip is probably caused by contiguity of the inflammation from the joint to its adjacent muscles the iliopsoas and piriformis anteriorly, and the gluteal posteriorly. Inflammatory changes in these muscles involve the movements of abduction

and flexion abduction mostly and are the cause of the pain felt at times in forced flexion (Gaeslen sign) forced flexion abduction of the hip (Laguerre sign) or hyperextension of the hip or the cause of limp. In 84 per cent of 65 cases discussed by the author and checked roentgenographically limp was present and in 46 per cent sciatic pain.

DAVID IMPASTATO, M.D.

### SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

Samson J. E. Fixation of the Femoral Aponeurosis for Paralytic Hip (*Aponévrotomie femorale dans la hanche paralytique*). *Lyon chir.* 1938 35 641

Samson advocates a method of treatment for paralytic hips which he describes as fixation of the femoral aponeurosis. A section of this fibrous strong resistant aponeurosis is passed through tunnels in the trochanter and ilium turned on itself around the crest of the ilium and reinserted in the great trochanter where it is fixed with kangaroo tendon. With the proper adjustment of this aponeurosis and determination of the tensor action necessary the extremity may be brought into good position.

For this operation the entire length of the aponeurosis should be used and Maissiat's band should be included. The tunnel in which the aponeurosis is to be placed should be of sufficient width to allow free play. In the great trochanter the tunnel is always made at the base of the bone. With complete paralysis of the gluteal muscles the tunnel in the ilium is made as close as possible to the posterior superior iliac spine as this best corrects the ante flexion if the paralysis is only partial involving

only the gluteus medius the tunnel is made nearly in the center of the wing of the ilium. With the extremity in good position it is placed in a plaster cast for from five to six weeks. After removal of the cast the patient must be trained to use the limb and finally to walk without support.

The author has performed this operation 131 times on 103 patients of these 72 have been re-examined or have been traced by correspondence. All of the 23 patients operated upon for partial paralysis (gluteus medius) show complete or nearly complete correction of their deformities. Thirty patients operated upon for total paralysis of the gluteal muscles are able to walk without support and with mobile knees and 10 of them have required an arthrodesis of the knee joint to correct a shortening of the limb of several centimeters. In 7 cases with a tensor paralysis the hip is nevertheless stable. In 8 cases the operation was unsuccessful either because of the fact that the tunnels were placed too far forward or because the aponeurosis broke away from the point of insertion in the trochanter. Two patients have died from intercurrent disease 3 have been operated upon too recently to determine the final results. Five illustrative cases are reported. 31 patients were operated upon before the age of ten years, the others (girls) were operated upon at the age of sixteen.

ALICE M. MORGAN

Bonola A. The Surgical Mobilization of Post traumatic Rigidity of the Knee (*La mobilizzazione chirurgica delle rigidità post-traumatiche del ginocchio*). *Chirurgia e organi di movimento* 1938 24 59

Bonola has treated surgically 26 cases of post traumatic rigidity of the knee. 8 were due to serious fracture of the patella, 8 to complicated condylar fracture and 10 to fracture of the femoral diaphysis especially the lower third. All cases had been immobilized for more than five or six months. The age of the patients ranged from seventeen to forty years and 24 of the patients were males. In all cases mobilization of the knee was a vital factor for the work or the career of the patient and the will to be cured was of decisive importance for the success of the operation. Ample destruction of cartilage was found in 9 cases operated upon from nine months to three years after the trauma had occurred. Contraindications consist of grave lesions or insufficiency of the extensor muscles peripheral nerve lesions and a poor condition of the skin. The rigidity of the knee may be due to changes in the extensor capsular apparatus and in the skin to adhesions in the joint and to changes in the articular cartilages caused directly by the edges of the articular fractures or through detachment of fragments of cartilage or indirectly through atrophy from inactivity (Fig. 1).

In many patients pre-operative physical therapy was instituted for several weeks because success depends on the condition of the skin. In the absence of even slight inflammatory reactions in the joint the



Fig. 1. Schema showing the size and position of the tunnels in the trochanter and ilium.



Fig 1

nutrition of the extensor apparatus, and the maintenance of the axis in the femoral and tibial segments. Before operation was performed a lapse of two or three months was allowed after complete healing of traumatic wounds and a lapse of ten or twelve months after healing of suppurating lesions. Ether anesthesia was used. The latero external parapatellar incision of Kocher, extended 3 or 4 cm further above and below to permit ample inspection of the joint and detachment of the tibial protuberance was employed in most cases. This was followed by section of adhesions in the subcutaneous tissue and the extensor apparatus, freeing of the tibial and

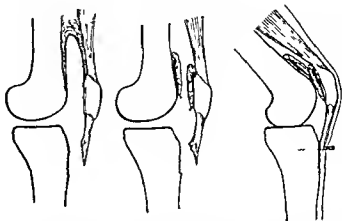


Fig 3 After articular extension beyond 90 degrees is obtained when the cartilaginous surfaces are altered a pedunculated flap is made by sliding the anterior wall of the subquadriceps cul de sac rich in adipose tissue onto the posterior aspect of the patella while the posterior wall of the cul de sac is made to cover the femoral condyles. Fixation of the tibial protuberance is done by transcutaneous introduction of Putti's nail with the knee flexed at about 40 degrees.

femoral condyles from the retracted and sclerosed capsule. Removal of the thick cicatricial articular shell with care whenever possible not to disturb the crucial ligaments and the continuity of the extensor apparatus. In 10 cases it was necessary to lengthen the quadriceps tendon to obtain flexion beyond 80 degrees, but in 6 cases preference was given to detachment of the tibial protuberance. Usually section of the adhesions of the extensor apparatus allows flexion not exceeding 50 degrees while section of the intercondylar adhesions allows flexion reaching 80 or 90 degrees (Fig 2). When flexion beyond 90 degrees has been obtained, the altered articular cartilages are covered with flaps of fascia lata, of aponeurosis from the lateral vastus or of the subquadriceps synovial cul de sac, the anterior part of which is made to cover the posterior aspect of the patella and the posterior part the femoral condyles.

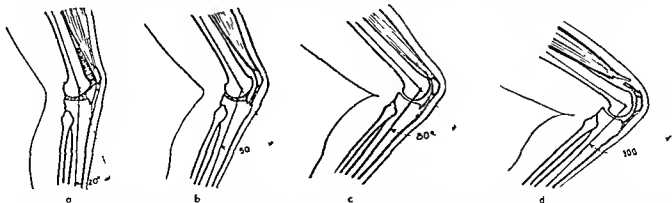


Fig 2 Schema of the stages of surgical mobilization of the knee. a Articulation before operation. Flexion is possible to 20 degrees only. b After removal of the adhesions of the extensor apparatus (quadriceps patella)

flexion up to 50 degrees is obtained. c In order to flex the knee beyond 50 degrees it is necessary to cut the intercondylar adhesions. d Further flexion beyond 90 degrees is possible only by lengthening of the extensor apparatus.

(Fig. 3) With the knee in extension the detached tibial protuberance is fixed above its former position by means of a double headed Putti nail traversing the skin. The joint is immobilized for ten days the sutures are removed after from fifteen to twenty days and Putti's nail after from twenty to thirty days. Postoperative physical therapy is of extreme importance and very protracted. Weight bearing and walking are allowed after twenty or thirty days and the plaster bandage is removed after fifty or sixty days. Usually the after treatment lasts three or four months and six months are needed to obtain complete extension. No serious postoperative complications occurred but in 4 cases it was necessary to tap articular hematomas.

Of the 26 cases which were treated surgically 22 could be followed up for from one to twenty years. In all cases in which adequate postoperative treatment was given active extension was practically normal and the joint was stable and painless. The results were excellent in 7 good in 10 mediocre in 3 and poor in 2.

RICHARD KEMEL, M.D.

### FRACTURES AND DISLOCATIONS

Campbell W. G. *Onlay Bone Graft for Ununited Fractures* *Arch Surg* 1939 38 313

Campbell states that two factors are necessary for a high percentage of excellent results in cases of non union namely (1) absolute fixation and (2) promotion of osteogenesis (callus formation). If there is no progress toward union at the end of six months the diagnosis of non union may be made.

In 213 patients the massive onlay bone graft was used on 261 bones with non union. The steps in the operation are as follows:

An ample incision is made over the site of non union. All intervening scar tissue is excised. An incision is made through the periosteum of each fragment and the periosteum is stripped from 1 to 1/4 in from the circumference care being taken that the soft parts which have been attached to the periosteum are not removed. The adjacent ends of the bone are freshened and each medulla is reamed out until normal marrow tissue is removed. Shavings are removed from one portion of the circumference until there is a continuous flat surface of 10 cm on each fragment if possible. A broad flat massive graft is taken from the tibia. The graft is split longitudinally by means of a motor saw through the edge or small diameter into two parts a strong outer plate consisting of dense bone or cortex and an inner layer the endosteum. A strip of endosteum is placed within the medulla. Six or eight autogenous bone nail of appropriate size are made from the outer plate. Three or four drill holes are then made through the graft and through the fragment into which the autogenous bone nail are driven. The remainder of the endosteum is broken into small particles and placed with the shavings about the site of the fracture. Spongy bone from the upper part of the tibia is obtained with a sharp bone

curette and applied around the area of fracture. Complete fixation is then obtained by means of a plaster of Paris cast or an efficient splint for a period of eight weeks. Following this a convalescent splint is applied in the form of a leather corset to reproduce the cast. The period of fixation is usually from two to four months. Active motion may be instituted at the end of from two to three months. The graft should not be applied under tension or gradual dissolution at the point of tension will result.

The author is of the opinion that of the 31 cases of infection in this series 29 could be attributed to the relighting of a previous pyogenic infection which occurred in compound fractures. It was necessary to regraft a bone in 5 instances in this series. There was solid union in 93.6 per cent of 251 operations. Sequelae occurred in 24 of the 31 cases of postoperative infection. In 7 of these union failed after amputation. Grafts were 100 per cent successful in 15 patients more than fifty years old.

There were 16 cases in this series in which the onlay method failed to produce a union. The end result of this type of onlay graft showed that the bone nails gradually disappeared and that there was usually permanent evidence of the graft as shown by an increase in the diameter of the shaft.

RICHARD J. BENNETT, Jr. M.D.

Heyl J. H. *Fractures of the Upper Extremity and the Shaft of the Humerus* *Arch Surg* 1939 38 295

One hundred and six cases of fracture of the upper extremity and shaft of the humerus occurring in a five year period are analyzed to evaluate traction in abduction as a form of treatment.

Nine cases of fracture of the shaft required open reduction because of malposition. Eight of these were of the transverse type traction being least effective.

Patients were hospitalized until clinical union was obtained. Callus being noted at four weeks and clinical union in five or six. Limitation of motion at the capulo-humeral joint was not a notable feature excluding fractures of the head and surgical neck. Skeletal traction was required in only 2 cases.

Of 17 cases of fracture of the greater tuberosity 12 were associated with dislocation at the shoulder joint and were satisfactorily reduced upon reduction of the dislocation. The results in this group seem to favor abduction treatment the average hospitalization being seventeen days.

Only 1 case of epiphyseal separation of the upper end of the humerus occurred in this series. There were 46 fractures of the surgical neck in 14 of which the greater tuberosity or head was involved and in only 1 was there associated dislocation. No typical displacement was noted the weight of the upper extremity and the fracturing force were seemingly the determining factors.

Firm impaction was exceptional. Cutaneous traction alone was not effective in reducing the overriding in fractures of the surgical neck. Traction abduction

was noted to increase the deformity in some cases. It seems preferable according to the author to align the distal fragment with the proximal one. This eliminates 90 degree abduction in most cases. However, he notes that partial loss of abduction and external rotation is not apt to occur as frequently when the part is treated in abduction.

In the treatment of fractures of the shaft traction abduction in combination with closed reduction proved an effective method of immobilization. This was true especially in fractures of the middle third and to a lesser extent in those of the upper and lower thirds. No cases of non union of the shaft occurred in this series.

LOUIS SCHEMAN, MD

Magnuson P B and Stinchfield F. Fracture of the Os Calcis. *Am J Surg* 1938 42 685

Fracture of the os calcis, with few exceptions is caused by a fall from a height when the body weight strikes on the heels. The impact of the weight of the body against the heel drives the posterior two thirds of the os calcis upward and outward and compresses it. The heel is shortened from front to back and broadened. The violence that causes the fracture and impacts the fragments actually disintegrates the bone cells, causing permanent loss of total length so that no amount of manipulation will completely restore the bone to its normal shape. The foot becomes pronated, the longitudinal arch is lowered, the peroneal tendons are displaced outward and may become compressed between the lateral surface of the os calcis and the fibula. There is immediate extensive hemorrhagic swelling followed frequently by bleb formation.

The lines of fracture are irregular and are not in planes which is easily shown by anteroposterior and lateral roentgenograms. Roentgenograms should always include stereolateral, lateral oblique, and anteroposterior views. An anteroposterior roentgenogram showing the posterior two thirds or three fourths of the os calcis and the malleoli can be obtained by placing the plate against the sole of the foot with the patient in a prone position, with the tube set close to the back of the knee and the rays projected downward and parallel with the long axis of the tibia. This view will give information regarding the widening and the amount of displacement of the posterior two thirds of the os calcis. The lateral oblique view is taken to show the anterior superior tip of the os calcis which may be fractured. This frequently small triangular shaped fracture fragment is likely to produce subsequent pain. The stereolateral view will show the lines of fracture into the astragalocalcaneal joint and the amount of change in the salient or tuberosity joint angle. In fractures of the os calcis this angle is lessened, dis appears or is reversed.

Numerous difficulties are encountered in the reduction of a fractured os calcis because this fracture is always impacted and the impaction is so firm that great force properly applied is necessary to overcome it. Without disimpaction nothing can be gained by

any treatment. Tongs, mallets, wires and plaster castings are useless unless they improve the position of the fragments and maintain them in the improved position. Methods mean nothing unless they are applied intelligently and are adapted to each case. The fact that several methods have been devised implies that none are easy to apply with the assurance of a satisfactory result.

There are certain fundamental principles to be considered in the treatment of a fractured os calcis. The technique necessary to care for a particular fracture will have to be devised. It may be that none of the widely publicized methods will meet the requirements and a combination of several or selected parts of several will be necessary. Four fundamental objects in treating a fractured os calcis are: (1) to break up the impaction, (2) to remold the fragments downward and inward away from the external malleolus and restore them to their normal position in relation to the mid weight bearing line of the foot, (3) to increase the height of the arch and re-establish the mechanics of the foot, enabling it to bear weight again without pinching the peroneal tendons and to avoid throwing undue strain on any of the mechanical structures that support the weight of the body as it applies to the foot, and (4) to restore the plantar fasciae to normal length.

It is almost certain that a fracture of the os calcis involves the astragalocalcaneal joint and a rough weight bearing joint surface further complicated with adhesions will probably produce pain regardless of the position of the os calcis. Weight bearing on a joint that is rough and irregular will produce traumatic arthritis. There is always some thickening and induration of the internal and external lateral ligamentous supports which result in fibrosis of these structures and limitation of medial and lateral motions.

The results of treatment of this injury have improved but the results will never be perfect in the hands of anyone or as a result of using any one method. It is an intra articular fracture in which a certain amount of bone has been destroyed and it is subjected to the trauma of weight bearing. To restore painless function implies perfect mechanical restoration of bone, which frequently is impossible, it also implies a freedom of motion between the os calcis and the astragalus which is practically always limited regardless of the methods used in reduction and maintenance of reduction. It is almost impossible to obtain ideal results.

The authors believe that the first step in treatment is to prevent swelling and rapid bleb formation which generally occurs as an immediate result of this fracture. The most satisfactory method used by the authors is the pillow splint advocated by Gurd. When properly applied, this will absolutely prevent the occurrence of bleb formation and will reduce the swelling so that within the short space of forty eight hours the treatment necessary for reduction of the fracture can be applied. Rather than to permit swelling to occur, the surgeon should postpone the

roentgenogram and put on a pillow splint or massive compression dressing promptly. The fragments do not change position; it is the swelling and bleb formation only that prevent reduction within a couple of days after occurrence of the fracture. Should there be bleb formation which cannot be cleared up in less than ten days or two weeks, treatment must be postponed until fixation can be applied. Therefore if swelling is permitted to occur, reduction of the fracture must be deferred until such time as the skin is in condition to tolerate the application of some fixation.

In 1917 Magnuson advocated cutting the Achilles tendon to relieve the action of the gastrocnemius and soleus muscles. This is very effective for maintenance of position of the fragments, but the calf muscles are permanently weakened and a disability results. Tenotomy of the Achilles tendon has been continued.

In regard to the employment of pins and calipers it must be remembered that a comminuted fracture and nearly all fractures of the os calcis are comminuted; cannot be reduced; not can all the fragments be maintained in reduction by placing traction on one fragment even though it is larger than the others.

In reviewing the various advocated methods of treatment, some from personal observation, the methods of the following authors appear to the authors as being the most logical procedures: Herman, Conn, Goff, Bohler, and Wilson. Pertinent points of each method are presented and discussed.

Herman's method was developed to eliminate the 10 per cent of cases that develop sepsis with the use of Kirschner wires and Steinman pins, and to prevent excessive bone formation beneath the malleoli. The after care is emphasized as being the most important step in the entire treatment. The plaster casts and submalleolar pads are replaced every two weeks. A special ambulatory os calcis brace is used following the removal of the last cast and details regarding physical therapy, exercises, and shoe alterations are carried out. Herman believes the good results are due chiefly to the after treatment which tends to maintain continued pressure beneath the malleoli and prevents the piling up of bone.

Conn reported a series of cases in which he used four different methods, but does not say upon what points of variation in the fractures he based his choice of method: (1) subastragalar arthrodesis with or without regrooving for the peroneal tendons; (2) combined forcible lateral compression of the os calcis with skeletal traction; (3) a two-stage operation of lateral compression and skeletal traction for five weeks, followed by a combined subastragalar, astragaloscaphoid, and calcaneocuboid fusion; and (4) on old cases in which a painful subastragalar motion was present, a triple arthrodesis. He believes that the results obtained were by far the best when the third method was used. In the opinion of the authors, this would not be justified in the average case.

Goff's method is designed to allow the patient to be ambulatory within forty-eight hours after reduction. A plaster cast is applied from the toes to the mid thigh and with the knee flexed 20 degrees a Bohler walking iron is incorporated. At the end of the second week the cast is cut below the knee, the lower half of the cast is removed in ten weeks, and full weight bearing is permitted at the end of eleven weeks. The authors question the advisability of allowing weight bearing so soon after the fracture because there must be some body weight pressure on the inferior surface of the os calcis which would have a tendency to force it up into a mal position.

In Bohler's method the injured leg is elevated on a Braun frame without traction and light massage is administered for eight or nine days before reduction and skeletal traction are employed. Bohler has discontinued the use of the Kirschner wire through the tibia for countertraction because of the danger of infection in the tibial region and about the ankle joint, which he states he has observed rather frequently. He depends on countertraction from the flexed knee on the Bohler frame at the time of the initial reduction.

When reduction is obtained, a non-padded skin tight plaster is applied carefully molded about the foot and ankle. The leg is again put on a Braun frame and traction of 15 lb is applied on the Kirschner wire. This remains constant for six weeks at which time the wire is removed and a new plaster is applied into which is incorporated a walking iron. This is removed six weeks later. At the end of from fourteen to sixteen weeks after the initial reduction the plaster and walking iron are discarded and full weight bearing is allowed. The patient is fitted with a shoe containing an inner sole to maintain the newly formed longitudinal arch. Bohler does not present such an ideal picture of the results of his method as seems to be prevalent in this country. He states that traumatic arthritis is frequent and cautions against overuse of the redresseur because of the possibility of a slough and against too early weight bearing.

Wilson concluded that it was almost impossible to get anatomical reduction in fracture of the os calcis and advised immediate subastragalar arthrodesis. He followed this method for some time. He exhibited very satisfactory results so far as painlessness was concerned, but the deformity produced by impaction and displacement of the fragments was not changed except insofar as the os calcis was moved somewhat inward at the time of operation and the heel inverted somewhat more than is usually the case immediately following fracture. Wilson's results were due probably to the fact that at the time of operation he was able to restore more or less the weight bearing position of the os calcis, that is, two-thirds lateral to the mid weight bearing line and one-third medial thereto, also the whole bone was moved medially at the time of operation.

This is a valuable operation and is necessary in probably from 30 to 35 per cent of cases even after

proper reduction, but in the author's opinion it should be postponed until the fracture is reduced and healed in as near anatomical position as it is possible to attain. Then if the patient has a painful astragalocalcaneal joint Wilson's procedure should be followed. In these cases the operation if properly performed gives a highly satisfactory result after ankylosis of the joint.

In 1923 Magnuson advocated an operation for the relief of disability in old fractures of the os calcis. In this operation the mass of callus which lies behind and beneath the external malleolus, which is an outgrowth of the widening and fracture of the os calcis, was removed with a gouge and the groove left much deeper than normal.

After the mass of bone had been removed from behind and beneath the external malleolus and the lateral supports of the ankle severed in getting to this excess callus, a Thomas wrench was applied with

the proximal arm lying along the outer margin of the foot over the os calcis and extending forward over the fifth metatarsal the distal arm lying against the medial side of the astragalus just below the internal malleolus. With strong, smooth steady pressure the foot was inverted, and with it the os calcis was carried medially.

It was found that a skin tight plaster, applied to the lower leg and heel and held firmly until it set was the easiest method of maintaining the heel in its position. The anterior part of the cast is applied after the height of the longitudinal arch is increased by firm eversion of that part of the foot anterior to the astragalus and after the posterior half of the cast has hardened. In this way the height of the arch was increased the os calcis was moved over to the midline and the pinching of the peroneal tendons was ultimately relieved.

ROBERT P. MONTGOMERY M.D.



# SURGERY OF THE BLOOD AND LYMPH SYSTEMS

## BLOOD VESSELS

Watson W L and Silverstone S M Ligation of the Common Carotid Artery in Cancer of the Head and Neck *Ann Surg* 1939 109 1

The authors present an analysis of 20 cases in which the common carotid artery was ligated at Memorial Hospital New York City during the years from 1926 to 1937. There were 17 men and 3 women and their average age was fifty years. The youngest patient was a man aged twenty seven years and the oldest a woman aged sixty nine. The left carotid artery was ligated in 13 cases and the right in 7. In 10 instances a modified Crile clamp was applied for periods varying from twenty minutes to forty eight hours. Seven of the patients died between six and one hundred and twenty hours after the operation.

Further analysis reveals that 11 patients died within five days of the operation. In 7 of these the Crile clamp had been used and in 4 an immediate ligation had been performed. In 6 of these 11 cases death was preceded by the development of hemiplegia and in 5 of these the Crile clamp had been used.

There were 6 patients in whom it was necessary to remove the common carotid artery at operation. Four of these made an uneventful recovery. The authors conclude that from this it would seem that immediate excision of the common carotid artery is less dangerous than simple ligation of the same vessel. Excision probably removes to a certain extent the dangers of thrombosis and embolism. The authors note that the most frequent cause of death following ligation of the common carotid artery is one form or another of cerebral complication. 8 patients in this series developed convulsions. Of those who died 70 per cent showed definite signs of cerebral involvement.

The history of the operation of ligation of the common carotid artery is interestingly but briefly presented. The details of the technique of the operation used by these writers are described. In a summary the authors conclude that the facts assembled by them seem to indicate that in patients with cancer ligation of the common carotid artery as an emergency procedure is hazardous. The operative mortality in their series was 55 per cent. Because of frequent variations and abnormalities in the anatomy of the arteries of the neck and brain it is suggested that these anatomical anomalies may largely explain the variety of cerebral complications occurring after ligation of the common carotid artery.

The collateral circulation outside of the cranium is probably of little significance after ligation of the common carotid artery. Age is apparently not a significant factor in the prognosis. The 5 youngest patients in this series died postoperatively. Six of

the 9 patients who recovered were over fifty years of age.

The use of the Crile clamp for gradual occlusion of the common carotid artery does not improve the prognosis. The most frequent cause of death was a brain complication while embolus hemorrhage and edema of the glottis are frequent factors in fatal termination. Thrombosis probably occurs quite frequently after ligation.

Finally the authors note that uncontrolled cancer sepsis debilitation hemorrhage dehydration and low blood pressure are factors influencing a fatal outcome following ligation of the common carotid artery. The pre-existing congenital blood vascular supply to the brain is an important factor which determines whether life can be maintained after one common carotid artery has been ligated.

HERBERT F THURSTON M D

Kappis The Present Status of Surgery of the Blood Vessels (Derzeitiger Stand der Gefässchirurgie) *Zentralbl f Chir* 1938 p 2190

The tradition that Antyllus undertook the first splitting and extirpation of an aneurysmal sac after ligation of the afferent blood vessels in the second century A D is legendary. However it is certain that up to the turn of the century surgery met only the purely mechanical demands of hemostasis. As compared with simple ligation the arterial suture introduced shortly after the turn of the century was a distinct advance. In 1907 Lexer found the ideal operation for aneurysm to be excision of the aneurysmal sac and transverse suture of the afferent and efferent vessels. If necessary a piece of the saphenous vein could be intercalated. The solution of functional problems through his periarterial sympathectomy stimulated Leriche in 1914 but the treatment of hemorrhage was left untouched and the greater problem was first considered during the World War. The results of the ligation are shown by the extensive statistics of Rabe (1885) Wolf (1907) and Heidenrich (1921). They show that a necrosis of the extremity appears in a definite percentage of cases following a ligation of certain arteries. Since these however include recent and older injuries secondary hemorrhages and aneurysms they do not show a clear picture of the question when no necrosis of a limb follows ligation of an artery. The greatest teacher in injuries of arteries was the World War and Surgeon Major General Franz in his text book on war surgery in the chapter on the shot injuries of the blood vessels has collected a great number of cases of the World War both among Germans and the enemy and has evaluated them as far as this is possible. However even these large statistical studies of Franz could not answer the question whether one should ligate or suture in the individual case. The individual surgeon will

always be compelled to decide this question for him self and bear the responsibility.

It is certain however, that the number of necroses of the extremities even according to the English Sanitary Report which Franz has utilized is very large following ligations, especially following ligations at the site of election. The mortality after ligations amounted to about 15 per cent and after sutures to 4 per cent. Necroses of the extremities following ligation occurred in 10.5 per cent of the cases and after suture in 3 per cent (Franz). Accordingly the suture offers a more favorable outlook for the maintenance of limb and life. In addition in his army corps Franz estimated only 325 (1 per cent) of such hemorrhages among 32,625 injured. For the very reason that a sufficient number of surgeons capable of doing vascular suture should be available in time of war, it seems important that this treatment be practiced in peace times. Drescher states (1936) that arterial suture was done only 3 times according to the literature in 64 injuries of arteries following dislocation of the shoulder. Necrosis of the arm developed in 2 cases and death occurred in 1. The figures in knee and other injuries should be equally as bad. On the other hand Kappis presumed that the good results are not reported. According to the English Sanitary Report shot fractures of the thigh with arterial injury showed a mortality of 80 per cent. Primary amputation is the safest curative procedure. Kappis expressed the surmise that improvement in the treatment of fractures and arterial suture will save many a leg in the future. Primary arterial embolectomy was carried out successfully by Lahey in 1911 and at about the same time by Key of Stockholm. The latter has become the protagonist of this procedure. However the results are not encouraging of 382 patients operated upon in Sweden 227 died in the hospital in 69 (18 per cent) an amputation was necessary in 86 (22 per cent) the result was good. Embolism of the bifurcation of the aorta caused the greatest mortality. According to Haimovici 9 of 38 embolectomies on the aorta were successful.

The permanent results are poor also as the patients are persons suffering from a cardiac or vascular disease. The statistics of Lund on 56 of his own observations show that of 29 patients who were treated conservatively for peripheral embolism 24 died 5 left the hospital 3 after and 2 without amputation of the extremity. Twenty seven patients were operated upon 24 by embolectomy 10 survived 5 had amputations and 12 died. The mortality of operative treatment was therefore 44 per cent while that of conservative treatment was 82 per cent. Operations after nine hours figured from the onset of the embolism no longer brought success to Lund. Immediate treatment is, therefore necessary.

Denk introduced the intravenous or intra arterial injection of 0.06 gm. eupaverin in the treatment. This can be repeated after a short time. If after one hour at the latest no result is visible an immediate embolectomy is indicated. With his procedure

Denk has cured 19 of 33 peripheral embolisms improved the condition in 5 cases and had no success in 9 cases. To be sure, a vascular spasm may simulate an embolism. At any rate a trial of this procedure is justified. After a lapse of ten hours an arterial resection according to the Leriche technique may still bring results. A lumbar sympathectomy with removal of the second to the fourth or fifth lumbar vertebrae seems to give more hopeful results. This is also indicated in juvenile arterial disturbances.

In 1879 Winwarter described the first case of endarteritis obliterans. He was followed by Buerger of New York with a monograph on thrombo angitis obliterans. According to the author there is hardly a remedy that has not been tried in this disease. As a result valuable time is often lost for surgical measures. In 1924 the Argentinian Diez showed the way with a successful lumbar sympathectomy in a young individual. In the meantime many permanent results have been achieved. A prerequisite however, is that the circulation in the endangered extremity should not be completely interrupted. The operation must not become the last refuge it must be undertaken early.

In 1916 Jonnesco removed the left stellate ganglion for the relief of angina pectoris. The results with it are not uniform. Some of the patients operated upon were left with the pain or suffered from other kinds of pain. According to Ochsenr, Leriche had the following results in 163 patients whom he operated upon 55.5 per cent were good 20.2 per cent showed improvement and there were 12.9 per cent of failures. The reproach, that with the removal of the pain one also eliminates the danger signal that warns the cardiac patient against overexertion is unjustified according to many experiences. Leriche says that the loss of the stellate ganglion brings with it at the same time the loss of the noxious vasoconstrictor reflexes and therefore, the spasms of the coronary arteries which are dangerous for the heart and the coronary arteries. The removal of the stellate ganglion and the dangerous reflex center can in this way and at the same time cure also the disease of the coronary arteries themselves especially in the early cases. The removal of the stellate ganglion could in this way not only symptomatically eliminate the pain of the angina pectoris but also act curatively upon the diseased cardiac vessels. Instead of the operation paravertebral injections of alcohol were made into the upper thoracic ganglia by Mandl, Svetlow Withe and others. With this procedure Withe had the following results in 38 cases unquestionably good, 70.3 per cent good, 16.2 per cent improvement in the condition, 5.4 per cent failures 8.1 per cent and 1 death.

In 1932 Blumgard proposed the total extirpation of the thyroid gland in cases of cardiac insufficiency not curable by internal measures. The frequently striking improvement in cases operated upon for Basedow's disease suggested it to him. Two of his own cases in which even the ligation of the two

superior thyroid arteries led to the disappearance of cardiac murmurs and cardiac enlargement made the author pay special attention to this idea especially since the dangers of myxedema and of tetany are so slight. Inasmuch as even the subtotal removal of the gland should be sufficient the author was more inclined to the latter. According to an American collection of statistics by Parsons and Larks, noteworthy results were achieved in America with this operation in angina pectoris and cardiac insufficiency. For this reason at the present time when it is apparently possible to bring almost half of otherwise incurable patients operated upon in this way into a good or considerably improved condition the question arises whether one should not gradually adopt this operation with caution.

The vascularization of the heart that has become anemic was proposed by Beck, an American, in 1935. In 1938 the Englishman O. Shaughnessy presented a film at the Surgical Congress. For the purpose of the vascularization in man the peritoncum, lung and parts of the musculature of the thoracic wall are suitable. However the introduction of an aleuronat paste into the pericardium for the purpose of securing adhesion of the visceral and the parietal layers seemed to the author to be the most preferable procedure.

The true cause of hypertension is as yet still unknown. At any rate 15 patients with adenomas of the adrenal medulla were cured also of their hypertension by the removal of the tumor. Some time ago Bruening expressed the view that extensive removal of the vasoconstrictor nerves should lead to the reduction of the blood pressure. After many kinds of experiments, some at the Mayo Clinic, the best remedy for the reduction of the blood pressure seems to be the division of the splanchnic major and minor on both sides, the extirpation of the first and second lumbar ganglia on both sides and the reduction in size of both adrenal glands, an intervention that should be done in two sittings. Allen and Adson have carried out 45 such operations without a fatality and with the result that in 70 per cent of the cases the symptoms referable to the eyes, kidneys and heart disappeared. The blood pressure remained unchanged in 45 per cent of the cases and was affected favorably in 30 per cent and excel-

lently in 25 per cent. The author would also have liked to discuss lumbar sympathectomy and reproductive power, ambulatory thrombosis of the veins and compression bandages, puerperal sepsis and ligation of the veins, but his own illness prevented him from doing so.

As a pathologist Nordmann expressed his opinion on operations on the nervous system: functional disturbances present only apparent or secondary changes but more difficult to understand is the role of the vascular nervous system in such completed anatomical findings as in endarteritis obliterans, as this involves the obliteration of large vascular stems. Since Buerger's monograph on thromboangitis obliterans much has been included recently which already had been excluded according to the clinical and anatomical findings and ought to be excluded again. In the case of endarteritis obliterans of Winternatter there was a connective tissue filling of the vascular lumina. Vascular spasms and dilatations precede the gangrene. Nordmann denies the existence of organized thrombi. The functional disturbances provide proof of an increased activity of the vascular nervous system. The afferent impulses probably come from the central nervous system. Symmetrically arranged vascular areas are affected. At first ischemia appears and then cyanosis. During the existence of the former the entire vascular system is constricted or occluded; during the cyanosis according to the experimentally found hyperemia of Ricker the terminal vascular areas are dilated but the afferent arteries are constricted. This spasm produces stasis of the lymphatic circulation in the vascular wall and this stasis again stimulates the endothelium to new growth. In this way there develops at first a pathological stimulation of the vascular nervous system and ultimately a connective tissue occlusion of a vascular lumen. Inasmuch as the innervation of the vessels is segmentary the Leriche operation can eliminate only a portion of the vascular nervous system. The higher the point of attack is chosen the better will be the result. Inasmuch as the endocrine glands influence the activity of the vascular nervous system indirectly their elimination (thyroid gland and adrenal gland) seems to be justified in certain cases.

(PLANA) LOUIS NEUWELT, M.D.

# SURGICAL TECHNIQUE

## OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

**Bottin J** Two Tests of Dehydration in Surgical Conditions (Deux tests de déshydratation chez les malades chirurgicaux) *Presse med* Par 1938 46 1763

Bottin has employed two tests to determine the state of hydration and dehydration of the tissues and blood in surgical conditions. His first test is similar to that of Aldrich and McClure except that the physiological saline solution (10 ccm) is injected into the subcutaneous instead of the intradermal tissues, and the time of its absorption determined. The author prefers the subcutaneous method, since when it is necessary to supply fluid after an operation physiological saline is often given subcutaneously (by hypodermoclysis) and this test serves to determine the condition of and the absorption from the subcutaneous tissues.

In patients who are in good condition and in whom the rate of absorption is normal with this test the author has found that after operation there may be an acceleration of the absorption rate after an uncomplicated operation. This indicates that there is a slight dehydration of the blood, which is corrected by the blood's taking up fluid from the tissues so that there is a slight and temporary dehydration of the tissues. In these uncomplicated conditions the absorption rate with the subcutaneous test returns to normal in forty-eight hours. In cases complicated by frequent and prolonged vomiting, the absorption from the subcutaneous tissues is at first accelerated, an indication of a dehydration of these tissues. However, if vomiting continues until the volume of the blood is diminished by the severe dehydration so that the blood pressure falls and the peripheral circulation is diminished, the absorption rate may be prolonged above normal. In such cases fluid should be supplied directly to the blood by intravenous administration until the absorption from the subcutaneous tissues becomes normal (or is slightly accelerated). Fluid may then be supplied by subcutaneous or rectal administration until it is possible to give the necessary amount by mouth.

Another test employed is a modification of the so-called imbibition test of Labbe and Violle, in which the gastrocnemius muscle of a frog is placed in the serum to be tested. In normal serum it loses a part of its weight (because of loss of fluid) in the first few hours and then regains it within forty-eight hours in serum from a subject with edema, it constantly gains weight, because of actual imbibition of fluid by the intramuscular connective tissue. In clinical cases the author has found it necessary to use whole blood with potassium oxalate (not over 2/1000) as an anticoagulant, as with the amount of serum obtainable changes are sometimes too slight to be cor-

rectly measured. The muscle to be weighed is freed from the red cells by repeated washing in the plasma of the patient on whom the test is made. The results of this test are in complete agreement with those of the subcutaneous absorption test. The slight dehydration of the blood after uncomplicated operations on patients in a normal state of hydration is evidenced by the fact that the frog muscle in the blood of such patients at first loses a larger percentage of its weight than in normal blood, i.e., loses a larger amount of its fluid because of a slight dehydration of the blood, but this is shortly regained. In the blood of patients whose condition after operation is complicated by vomiting with consequent loss of fluid, the frog muscle loses a still larger percentage of its weight at first and continues to lose weight for a long period of time (several days), an indication of a more severe degree of dehydration of the blood which is not compensated for by rapid absorption from the tissues. This confirms the author's conclusions from his first series of tests that in cases of severe postoperative dehydration fluid must be supplied directly to the blood by intravenous administration until the blood volume and the peripheral circulation are restored to normal.

Alice M. Meyers

**Lehmann, A.** Clinical and Experimental Studies on Intestinal Paralysis in Extra-abdominal Traumatic Injury to the Trunk. *Acta chirurg Scand* 1939 81 439

The author reviewed a series of 497 patients with such different injuries as fractures of the ribs, vertebral column and pelvis as well as contusion of the back and injury to the kidney, and noted that intestinal paralysis occurred in 22 cases.

The most characteristic feature in these cases was the marked, often violent, degree of meteorism that developed rather unnoticed, almost insidiously from the second or third day after the accident. There were no precursory abdominal symptoms so that one could almost say that there was a free interval or latent period between the time of the accident and the appearance of the marked abdominal distention. However, neither the general condition of the patient nor the pulse were affected particularly, and vomiting was relatively rare. It was very difficult to re-establish intestinal peristalsis, and in 11 cases there was a fatal outcome. This patient was a man sixty-six years old who suffered a relatively slight injury to the back without any demonstrable fractures who then had a violent paralytic ileus and died in spite of enterostomy performed on the fifth day after the accident. Autopsy revealed nothing abnormal in the abdomen except marked distention of all sections of the small and large intestines without any demonstrable mechanical cause. The only abnormality found was a large right paravertebral hematoma ex-

tending from the ninth to the twelfth ribs. In addition there was a hematoma between the posterior surface of the vertebral bodies and the posterior longitudinal ligament throughout the removed part of the vertebral column (from the seventh dorsal to the fourth lumbar vertebrae). The spinal cord was normal.

It is suggested by the author that the paravertebral hematoma might have had an irritative effect on the splanchnic nerves and sympathetic chain which because of their inhibitory effect on intestinal peristalsis might have produced intestinal paralysis.

In 8 of the 11 cases reviewed by the author it was found that the injury was located supradiaphragmatically in this very region around the origin of the splanchnic nerves. He explains the fact that intestinal paralysis in lesions of the trunk above the diaphragm is relatively more frequent than when the lesions are in the lower part of the body on the basis of the anatomical arrangement of the spinal ligaments and the retroperitoneal and retropleural tissue spaces. The relationships between those structures and the sympathetic plexuses are described and illustrated in detail in the article.

Animal experiments which appear to show that hematomas around the splanchnic nerves and the sympathetic chain are able to produce intestinal paralysis are also presented.

The author believes that the operation of enterotomy performed in his fatal case was irrational because of the fact that the entire intestine was paralyzed. He states that perhaps lumbar anesthesia would have produced a better result as then the sympathetic fibers to the intestine would have been paralyzed and perhaps peristalsis might have been reestablished.

He recommends therefore in those cases of traumatic paralytic ileus in which the condition becomes so threatening that it does not seem safe to wait longer that a local injection of novocain be made into the hematoma as is done in the reduction of vertebral fractures or in lumbar anesthesia.

SAHIEL H. KAPLAN, M.D.

**Babcock W. W.** The Prevention and Management of Postoperative Intestinal Incompetence. *Surg. Clin. North Am.* 50:38 19 1909.

By intestinal incompetence Babcock refers to inadequate motor secretory or absorptive capacity of the bowel. Obviously the common conditions are those resulting in partial or complete obstruction but excessive peristalsis and diarrhea also express relative incompetency. He refers to certain reflex gastro-intestinal arcs such as the ileocolonic reflex in which irritation about the ileocecal valve results in pylorospasm, consequent gastric retention and accumulative hyperchlorhydria. Familiarity with the gastro-intestinal expressions of cardiovascular, pulmonary, renal or pelvic disease as well as of tabes, herpes, psychoneurosis, hyperthyroidism, plumbism and the like may prevent serious errors in diagnosis and treatment.

Babcock believes that drastic purgatives and repeated enemas which have been used for many years preceding the operation as well as the calomel and saline laxatives administered after the operation have created much postoperative vomiting, cramps and tympany. He does not believe that the various drugs injected subcutaneously to stimulate the laggard bowel such as strychnine and eserine are of any value.

After the exposure and trauma of an abdominal operation two or three days of rest usually are required for the gut to regain its normal function. During this period aggressive stimulation is harmful. Laxatives may provoke vomiting and distention and enemas are usually ineffective and cause discomfort. If a rectal tube is used it should be a well lubricated small catheter. Babcock believes that as long as inadequate attention is given to the avoidable causes of postoperative intestinal incompetence it is evident that the temptation to use peristaltic tonics will recur. If used they should be used with much circumspection and never if there is peritonitis or organic obstruction.

The author has seen patients in whom the appendiceal stump was blown out and perforating ulcers of the intestine have been observed in patients in whom such injections were used. Unnecessary and anatomical incisions while not so common as formerly are still observed. Instead of excising an old scar with its defects and adhesions the operator makes a new one with a new line of denuded tissue to fuse with underlying intestinal structures. Babcock believes that if the peritoneal tears and the muscle come in contact with bowel an important source of adhesions is left. Such peritoneal separation is most easily prevented by transverse or oblique incisions. He does not believe in the use of amniotic fluid or ferments as a routine treatment for the prevention of peritoneal adhesions. Retained blood and clots in the peritoneal cavity provide culture media for bacteria and a matrix for organized adhesions. Suture and ligature material may produce a decided reaction in the wound. This is true particularly of catgut to which some persons may be susceptible while wound sutured with silk or rustless steel wire heal more rapidly with greater strength and less tissue reaction.

The author decries the use of rubber and gauze drains. He prefers non-soluble pyrex glass of large diameter to which there is little plastic reaction. These glass tubes from 2½ to 5 cm in diameter which he calls lamp chimney drains are anchored to the wound but float in the peritoneum. He believes that swallowed air is the chief ingredient of gases present in the gastro-intestinal tract during the postoperative period. Persistent eructation should be treated by suction drainage or an anchored cork between the teeth. He believes that most patients do far better if visitors and sympathetic members of the family are not permitted to see them. Fruit juices, fats, coarse foods and those to which the patient is allergic should be avoided.

Asafetida rectal suppositories, and small enemas of the milk of asafetida have some value in the prevention of colonic distention. The Wangenstein type of gastroduodenal suction is advantageous in postoperative ileus but the Miller Abbott tube should be reserved for a few special cases. Babcock by far prefers multiple enterostomies and colostomies in the presence of ileus from peritonitis. He believes that enterostomy is perhaps the most useful operation for postoperative ileus. For the performance of the enterostomies, he uses evipal combined with local anesthesia.

WILLIAM C. BECK, M.D.

#### ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Abel J. J. Firor, W. M. and Chalian W. Researches on Tetanus IX. Further Evidence to Show That Tetanus Toxin Is Not Carried to Central Neurons by Way of the Axis Cylinders of Motor Nerves. *Bull. Johns Hopkins Hosp. Balt.* 1938 63: 373.

The chief arguments that have been brought forward in support of the theory of Meyer and Marie were subjected to a detailed analysis and evidence is offered to show that tetanus toxin is not carried to the central nervous system by way of the peripheral nerves but is transported throughout the body by the blood and lymph vascular systems. The toxin of *Clostridium tetani* is thus brought into line with countless other noxious agents for which it has not been necessary to assume a special mode of conveyance by the components of peripheral nerves. The following theory which was set forth in previous publications, is upheld: the toxin exhibits both a central and a peripheral action, each of which may be demonstrated independently of the other. The central effect which is characterized by reflex motor convulsions is due to the poisoning of the motor nerve cells of the spinal cord, medulla and pons; the peripheral effect recognized as the unremitting rigidity of voluntary muscles results from the fixation of the toxin upon the motor end organs. Evidence of the rapid fixation and subsequent immobilization of the toxin is afforded by the consequences of the injection of very small quantities of the toxin into the anterior horns of the spinal cord and by the method of multiple intramuscular injection into a front or hind leg.

The defenders of the axis cylinder method of conveyance have failed to explain in a satisfactory manner why in local tetanus only one of the two cardinal symptoms of tetanus—an enduring mus-

cular rigidity—appears while in general tetanus when the toxin can travel only by way of the same centripetal axis cylinder route as in local tetanus, both muscular rigidity and an increased reflex excitability appear.

Even when the sciatic nerve is blocked with adequate antitoxin, local injection of the toxin into the muscles results in the same amount of local tetany as when no antitoxin has been injected. It is theoretically possible to throw all of the striated muscles into tetany by the use of 0.5 of the dog lethal dose administered intramuscularly.

The conclusions adduced from this work tend to refute the recent work of Doerr and his associates who attempted to prove the validity of the older theory of Meyer that the toxin made its way to the central nervous system via the axis cylinders.

JOHN WILTSE LPTON, M.D.

#### ANESTHESIA

Gross R. E. The Use of Vinyl Ether (Vinethene) in Infancy and Childhood. *New England J. Med.* 1939 220: 334.

The author employed vinyl ether as a general anesthetic in a series of 100 infants and children ranging from one month to eleven years of age. This drug was extremely satisfactory for minor operative procedures, and in no case was there any alarming or untoward reaction accompanying or following the anesthesia. The extremely rapid induction period with this drug permitted full muscular relaxation in from thirty to forty five seconds. The period of recovery was likewise short and in practically all cases the patient had regained consciousness in two or three minutes and older children were talking and sitting up by the end of this time. There was post-anesthetic vomiting in only 5 cases.

Vinyl ether can be administered in a closed gas machine, mixing the vaporized drug with oxygen, but since the operation in which the anesthetic should be employed is a short one, this method of administration is somewhat cumbersome. The drug can be given easily and quickly on an open mask, and when thus employed in the reported series it was always satisfactory.

The author concludes that vinyl ether appears to be the safest and most satisfactory general anesthetic yet produced for operative procedures of from five to ten minutes duration in infancy and childhood. The cost which ranges from 25 to 40 cents for an average dose is moderate.

JACOB M. MORA, M.D.

# PHYSICOCHEMICAL METHODS IN SURGERY

## ROENTGENOLOGY

Moller P F Chronic Fluorine Poisoning Seen From the Roentgenological Standpoint *Brit J Radiol* 1939 12 13

Chronic fluorine poisoning in man was first demonstrated by roentgenological diagnosis. In the course of some investigations for silicosis in workers in a cryolite factory the author in 1932 discovered bone changes in a number of the workers differing from those of any known disease. In connection with these changes various clinical and pathological findings corresponding to those described by Brandt and Tappeiner in dogs when chronic fluorine poisoning was produced in them experimentally were noted. Cryolite contains a high percentage of fluorine and investigation disclosed that it was the swallowing of the dust of this chemical which was responsible for the changes noted.

Although most of the individuals affected had gastro intestinal chest and muscular symptoms the principal sign of the poisoning was the change in the bones. These changes were mainly in the form of an osteosclerosis involving primarily the bones of the pelvis and spine but practically all bones showed changes of various degrees in some cases. Normal bone structure was replaced by a dense woolly in distinctness and points of muscular or ligamentous attachments showed excrescences due to extensive calcification which sometimes extended into the ligaments. The degree of sclerosis was dependent upon the length of exposure appearing at the earliest after two and one half years. Roentgenological findings have been corroborated by post mortem examinations.

Research work in connection with fluorine poisoning has revealed a much larger rôle in biology for that element than has been suspected. It has been found present in widely separated regions in various combinations. It may exert poisonous effects in drinking water and in plants which are eaten and if it is swallowed in dust or inhaled in gases. Degenerative dental changes resulting in so called mottled teeth have been shown to be caused by it and osteoporosis or osteomalacia in animals has been produced with it. In view of the established facts it is apparent that prophylactic precautions are required to guard against the harmful effects of fluorine in industry and also in private life.

ADOLPH HARTUNG M D

Ragheb M The Radiological Manifestations in Bilharziasis *Brit J Radiol* 1939 12 21

In bilharzia ova are commonly deposited in the submucosa of the urinary and gastro intestinal tracts and cause ulceration and calcareous deposits or the formation of papillomas which may ulcerate or become calcified and be revealed roentgenologically.

The ulceration and deposits are predominant in the urinary bladder ureters and seminal vesicals whereas the papillomas are usually found in the intestines and kidneys. When calcification is present the changes are readily demonstrable otherwise the introduction of opaque material is necessary for their visualization.

Papillomas in the large intestines rarely calcify except in the region of the appendix where they may present as small rounded or club shaped calcareous shadows. In the urinary tract the calcification of papillomas is common and the fact that they undergo little or no change of position or size on repeated examinations even after long interval usually serves to differentiate them from urinary calculi.

The bladder as a rule is the first organ to give evidence of bilharzial infection. Calcifications may vary from thin lines involving limited portions of the wall to heavier shadows completely outlining the organ. Depositions in an irregular manner may cause dense bands within the boundaries. In advanced chronic cases contraction occurs and the shadow may resemble a large calculus except that it is almost always of irregular density. Similar changes take place in the ureters. If the vesical openings become occluded dilatation of the proximal passages takes place. They may be outlined in their entire extent by calcifications. In the pelvis of the kidney papillomas may be demonstrated by pyelography.

Bilharzial infection of the seminal vesicles is seen in relatively few cases. When present it usually involves the vesicle in their entirety and presents a tapering cluster of small adjacent and close rounded calcifying masses diminishing in size as they approach the tapering end.

Involvement of the colon is most apt to occur in the pelvic part and sigmoid. In the early stages evidences of spastic colitis only are demonstrable but later when the papillomas become larger and more numerous the opaque enema reveals rounded areas of filling defects in close proximity to each other.

Numerous roentgenograms are included illustrating the conditions described.

ADOLPH HARTUNG M D

Westermarck A The Roentgen Diagnosis of Primary Tumors of the Lung *Acta radiol* 1938 to 50

The author divides the radiographic findings in bronchosteno into three stages. (1) slight steno is producing slightly diminished aeration and hyperemia peripheral to the stenosis, visible in the radiograph as a lightly diffuse opacity. (2) marked steno is producing emphysema and anemia peripheral to the obstruction this area appears as a translucent region in the radiograph. (3) a trans-

sitory stage between the foregoing groups characterized by inspiratory density and expiratory clarification and (3) complete occlusion producing obstructive atelectasis and hyperemia peripheral to the stenosis evidenced as a massive wedge of opacity in the radiograph

Although benign tumors of the bronchi are very rare, polyps, fibromas, papillomas, lipomas, myomas, adenomas, and chondromas have been described. These benign tumors produce bronchostenosis; by bronchography they are found to cause smooth rounded protrusions into the bronchial lumen. Differential diagnosis from enlarged mediastinal glands or mediastinal tumors may be difficult.

Chondromas are the most common benign tumors of the lungs. They present a well localized rounded or somewhat irregular massive shadow in which irregularly mottled calcifications can usually be distinguished. Differential diagnosis from echinococcus cysts is dependent upon the absence of capsular calcification and of subphrenic lesions which are found in the latter.

The author has studied 55 cases of bronchial carcinoma and has proved that the incidence of bronchial carcinoma as compared to carcinoma of the stomach has definitely increased in recent years. The ages of his patients have varied from thirty eight to seventy seven years and more than half have been under fifty years. He has found bronchial carcinoma to occur five times as often in men as in women. The right lung is involved three times as often as the left. The lower lobes have been involved somewhat more frequently than the upper lobes and when the lower lobes have been involved the cancer has been located in one of the dorsal branches. Three types of tumor have been seen: those localized to the bronchial wall, those diffusely infiltrating the lung, and those located in the middle of a lobe. Tumors originating from the bronchial wall are soft nodular or papillary tumors occluding the lumen, or localized stenosing infiltration of the bronchial wall. The tumors which form a diffuse infiltration may affect all or the major part of a lobe. The circumscribed tumors in the middle of a lung lobe are usually relatively benign and extend expansively into the lung being often surrounded by a capsule.

In 53 of the 55 cases seen by the author bronchostenosis was the first symptom, 16 showed valvular stenosis and 37, complete bronchostenosis with obstructive atelectasis. The diagnosis of tumor necessitates a bronchographic examination. At St. Goran's Hospital the pharynx and hypopharynx are anesthetized with 2 per cent pantocaine following which from 2 to 5 c cm of iodized oil are injected. In the bronchograph the tumor appears as a con-

tinuous filling defect with stiff and torn outlines causing variable degrees of stenosis of the lumen. If stenosis is complete the filling defect assumes the shape of a stiff and torn cornet which may encroach upon several adjacent bronchial branches.

Sarcomas form more or less rounded tumors which may occupy a whole lobe or an entire lung; their growth is expansive. Radiographic studies reveal a massive homogenous shadow in the center of a lobe, occupying an entire lobe or an entire lung.

HAROLD C. OCHSNER, M.D.

## RADIUM

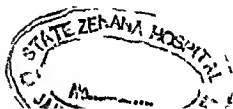
Engel, D. An Experimental Study of Radium on Developing Bones. *Brit. J. Radiol.* 1938, 11, 779.

Previous experiments by the author revealed that spinal curvatures could be produced in developing goats, dogs, and rabbits if the epiphyseal cartilage of one half of one or several vertebral bodies was destroyed with radium therapy. In the present experiments rabbits were used. Four to twenty five day mgm. of radium were applied in the form of 5 tubes of 1 cm. length, and 1 mgm. needles of 2 cm. length filtered with  $\frac{1}{2}$  mm. of platinum. The needles were fixed to the skin with adhesive plaster or transfixed through the skin and applied to the bone directly. Usually one posterior extremity was used. The ages of the animals at the time of irradiation varied between three and ten weeks. Radiographic examination was made one, three, and six months after treatment. A post mortem examination was made in each case, and detailed protocols are given.

In every rabbit to which a sufficient radium dosage was applied and which was observed for a sufficient period, the treatment resulted either in shortening of the extremity or deformity or both. The results depend upon three factors: the age of the animal, the dosage of radium, and the technique of irradiation. The younger the animal was, the greater the bone shortening; the greater the dosage, the greater was the degree of retardation of growth; and the more direct the contact of the needle with the bone, the greater was the reaction. The more highly developed an animal was from the phylogenetic standpoint, the more sensitive was its cartilage.

The authors believe that the response of the epiphyseal cartilage is so constant as to merit the proposal that this response be utilized as a test of the biological effect of radium. The epiphyseal cartilage responds first with an arrest of growth, which is followed by a transitory stage of overproduction and finally with arrested growth.

HAROLD C. OCHSNER, M.D.





## MISCELLANEOUS

### CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Roelsen E. The Composition of the Alveolar Air Investigated by Fractional Sampling *Acta med Scand* 1939 98 147

The composition of the alveolar air was examined by means of fractional sampling. Thirty seven experiments were performed on 13 subjects with sound lungs. The mode of procedure was as follows.

Immediately after an ordinary respiration experiment in which the expiration air was collected in a Douglas bag and the respiration volume, respiration rate and the oxygen metabolism were determined the test subject rapidly expires into a spirometer to the residual air samples of the alveolar air being taken simultaneously with Sonne and Nielsen's glass slish. The apparatus used in these experiments and the method of calculation are illustrated and described in detail.

The author found that the average decrease of alveolar oxygen amounts to .24 per cent per second (.6 per cent per second per liter) whereas the respiratory quotient in expiration air indicates that alveolar air undergoes a decrease of .022 per second. In the majority of cases the graphic reporting of the decrease of alveolar oxygen showed the greatest decrease of percentage in the beginning of the expiration whereas during the termination it became less marked and sometimes was even replaced by an increase of the alveolar oxygen percentage. The percentages of alveolar oxygen and alveolar CO<sub>2</sub> were from 13 to 15 per cent and from 5 to 6 per cent respectively on an average.

A comparison between the decrease of alveolar oxygen per second observed and the decrease of oxygen calculated under the assumption of homogeneous alveolar air and of equal blood circulation through the lungs reveals insufficient agreement. This is due to the fact that the basis of the calculation is not valid—a might partly be expected considering the results of the hydrogen experiments previously published by the author. A calculation of the decrease of the alveolar oxygen performed under the assumption of inequality of ventilation and of equal blood circulation in the lungs frequently yields a greater decrease of the alveolar oxygen than that actually found in the experiments. This is suggestive of inequality not only in the ventilation of the lungs but also of their blood perfusion. Some experiments because of a marked decrease of the blood perfusion of certain hypoventilated sections of lung reveal a rise of the alveolar oxygen percentage during the termination of the maximal expiration.

Similar serial experiments were performed on 17 patients with asthma and emphysema. In 5 of whom, however, the emphysema was dubious. The average decrease of alveolar oxygen amounts to 0.73 per cent

per second (1.36 per cent per second per liter) whereas the respiratory quotient in the expiration air and alveolar air decreases by .03 per second. The decrease of alveolar oxygen which deviated considerably from the normal and the considerable decrease in the respiratory quotients in the expiration air and alveolar air are adequately explained by the very unequal lung ventilation in emphysema patients.

The alveolar oxygen percentages are often normal and sometimes somewhat low (from 11 to 13 per cent and occasionally about 10 per cent) whereas the CO<sub>2</sub> percentages in the majority of cases are normal (from 5 to 6 per cent) and in one of the authors' patients amounted to about 7 per cent.

A comparison between the present examinations of the alveolar air and previously published hydrogen examinations shows that the blood perfusion of the hypoventilated sections of lung certainly is greatly reduced in emphysema patients.

Because varying samples of alveolar air from one and the same expiration vary widely, one must be careful in calculating the dead space on the basis of isolated alveolar air values.

The importance of very unequal lung ventilation for the pathogenesis of dyspnea in patients with asthma and emphysema is also discussed.

Generally there is found fairly satisfactory agreement between the magnitude of the decrease of alveolar oxygen and the clinical condition of the patients. For the estimation of the clinical condition the decrease of the alveolar oxygen is not very suitable, however, because the examination permits of too many sources of error. The influence of the pulmonary circulation no doubt plays an uncontrollable part in the magnitude of the decrease of the alveolar oxygen.

SAMUEL H. KLEIN, M.D.

Allen F. M. Physical and Toxic Factors in Shock *Arch Surg* 1939 38 135

It is possible to distinguish theoretically three entities included in the present interpretation of the word shock. One of these is the neural injury which may partly be defined as to anatomical lesions and physiological effects such as reduction of the blood pressure and may appropriately be covered by the term shock because of its vagueness and the logical relation to the original meaning of the word.

The second is the other element which is often assumed to exist in primary shock, namely an influence of the injured tissues, apart from the nervous injury. Neither the nature nor the actual existence of this element has been positively demonstrated but it should be subject to investigation in tissues separated from their nerve connections and the part played by circulatory factors, dehydration, temperature, infection, tissue toxins or anything else should be definable.

The third is the condition now called secondary shock and since this is recognized as being entirely different from primary shock and also a departure from the everyday meaning of the word shock a replacement of this clumsy designation by something more definite seems desirable. While the evidence obtained in the present investigation is unfortunately only indirect it at least suggests some such provisional name as histotoxicosis.

The vasomotor and other phenomena may thus be conceived as resulting from nervous and humoral agencies which supplement each other as in so many other physiological processes. This hypothesis at least offers a rational explanation of the entire range of events classifiable in three degrees: (1) in injury, such as a small contusion or burn in which the combined nervous vasodilation and histotoxin production cause only local redness and swelling without appreciable constitutional effects; (2) more extensive damage involving primary general vasomotor disturbances of nervous origin and the formation of greater quantities of histotoxin, which not only augment local transudation but also escape into the circulation and set up similar processes throughout the body (this loss of fluid however, can still be compensated for by administration of sufficient fluid), and (3) still more extensive or intensive damage in which either the primary nervous disturbance or the secondary production of histotoxin may be fatal in spite of the preservation of fluid balance at all stages.

The final demonstration and designation must be left to the chemist who may be able to identify the hypothetical histotoxin. Local asphyxia may be regarded as the ideal method for this study because of the simple and accurate control, exclusion of the nervous factor by the ligation, absence of dead or dying protoplasm, avoidance of other complications and the possibility of full recovery of the animals when desired. There may be conjecture whether the condition of secondary shock or histotoxicosis uniformly originates from asphyxia in the sense that injuries may disturb cell respiration.

Regardless of this speculation the proved fact that this condition can be caused by tissue asphyxia supports the opinion that a variety of conditions, including infection, hemorrhage, dehydration, circulatory or respiratory failure or any prostration severe enough to cause a certain deficiency of blood supply in any part or throughout the body may give rise to asphyxial histotoxicosis and that the clinical difficulty of distinguishing these states sharply from the so called secondary shock may be due to an essential and inevitable mingling of the conditions.

The most distinctive characteristic of secondary shock is the increased concentration and reduced volume of the blood caused by migration of the fluid into the tissues. The changes in the red cell content are the most quickly and easily ascertained index of this process. Temporary local asphyxia of limbs or other tissue masses appears to offer the

best experimental means for producing this condition because of its simplicity, its accuracy of control, its freedom from complication by tissue necrosis and other conditions, and the opportunity it affords for studying various details.

Traumas which typically produce primary shock repeated during a period equal to that within which secondary shock is able to manifest itself, fail to cause the characteristic blood changes of secondary shock, thus corroborating the view that the two conditions are radically different.

The effects of local asphyxia, as regards both changes in the blood and the attendant symptoms and death of the animals can be prevented by sufficiently early amputation of the asphyxiated parts as is already known of similar operations on the human being. Amputation does not save the life at a later stage after more advanced changes in the blood have occurred.

The following therapeutic observations have been made with various methods of replacement of the migrated fluid.

1. Animals at the point of death may be revived with transfusions of whole blood, while separated corpuscles or plasma have less value, and saline solution has practically none. Such recovery is always brief and no amount of the fluids mentioned saves life at this stage.

2. Death which regularly occurs under certain standard conditions, e.g. after five or six hours of asphyxia of one hind leg of a rat is preventable by means of early transfusions with blood or plasma, not with corpuscles. These results and those under 1 agree fully with the clinical evidence of the value of transfusions of blood or plasma to compensate for the loss of circulating fluid under certain conditions in shock. An equivalent benefit from acacia solution was not demonstrable.

3. The results mentioned under 1 and 2 are obtained practically as well with the blood of animals dying in shock as with normal blood. This disproves the existence of any considerable amount of toxin in the circulation.

4. After asphyxia of extensive masses of tissue, transfusions of blood or plasma no longer suffice to save life even though the corpuscle count is kept at a normal or reduced level and all indications point to normal or increased blood volume together with adequate propulsion of the blood. Theories which regard these factors as determinative in shock are thus invalidated.

5. In the conditions described under 4, simple injections of saline solution are able to save life when plasma fails. It is deduced that the essential physical factor is the obligatory edema or avidity of the tissues for fluid, and that the most important requisite in treatment is a fluid which will pass easily out of the vessels to satisfy this need. When this is supplied, the plasma automatically remains in the vessels. The composition of the blood and the animal's life are preserved notwithstanding abnormal permeability of the vessels or other changes.

6 After more intensive i.e. more prolonged asphyxial injury of the tissues death occurs in spite of injections of saline solution which prevent the rise of the corpuscle count and maintain the gross appearances of adequate filling and circulation in the vessel. It seems possible that the composition of either the blood or the tissues is altered to a fatal degree.

7 Various therapeutic attempts along other lines than fluid replenishment have failed so that the physical hypothesis must be credited with suggesting the only helpful form of treatment.

The effects of focal asphyxia as regards changes in the blood symptoms and death are augmented by heat and inhibited by refrigeration of the parts during asphyxia.

On the basis of the evidence in favor of the toxic hypothesis it is suggested that a substance or substances derived from the injured protoplasm may be a highly important factor affecting the vascular permeability, edema formation and other symptoms. The use of such a term as *histotoxicosis* is therefore suggested provisionally.

SAMUEL KAHN, M.D.

Cecil R. L. and Angevine D. M. Clinical and Experimental Observations on Focal Infection With an Analysis of 200 Cases of Rheumatoid Arthritis. *Ann. Int. Med.* 1938 12: 577.

In this paper the term rheumatoid arthritis is used to describe the picture of a chronic progressive inflammatory disease of several joints which is characterized in the early stages by periarthritic swelling and fusiform fingers and in the later stages by ankylosis and deformity.

The authors review a series of 200 clinical cases of chronic infectious arthritis which Cecil and Archer reported in 1927 with special reference to the incidence of focal infection. In this report focal infections appear to have been very common and the removal of foci especially when carried out early in the disease seemed to produce beneficial results in a good proportion of cases. Today the author would probably omit many of the cases as not fulfilling the criteria of rheumatoid arthritis and in view of present knowledge it is possible that a good many patients would have shown improvement even if the foci had not been removed.

In contrast with this series they present an analysis of a group of 200 cases of typical rheumatoid arthritis taken from records in the private practice of Cecil. No case has been included that did not fulfill the classical pattern of the disease. For example every case in the series showed or had shown at some time previously several characteristic fusiform fingers which in the authors' opinion are a typical manifestation of this syndrome. The sedimentation rate was accelerated in 93 per cent of the patients and the agglutination reaction with a strain of hemolytic streptococcus was strongly positive in 65 per cent. There was definite evidence of infection in 20 per cent and a

questionable focus in 10 per cent. Seventy per cent of the patients revealed no demonstrable focus of infection.

Experimental work was performed on rabbits in an attempt to produce foci of infection and arthritis. From these studies the following information was obtained:

1 Arthritis was produced in only 11 of 100 rabbits which were given injections by other than the intravenous route. To accomplish this it was necessary to use large doses of a suitable strain of streptococcus as well as a most susceptible animal.

2 Arthritis developed only in those animals from which streptococci were recovered from the blood stream shortly after the injection.

3 In rabbits the gums were a particularly favorable site for the absorption of bacteria.

4 Repeated injections of bacteria caused no more arthritis than a single injection.

5 It was difficult to establish a chronic persistent focus of infection in rabbits.

The authors stress the point that in the final analysis the decision regarding the eradication of so-called foci of infection should be made by the internist rather than by the specialist and that physicians should exercise a more conservative attitude than they have in the past regarding the treatment of tonsils, teeth and sinuses in rheumatoid arthritis.

A complete reevaluation of the focal infection theory is necessary. Undoubtedly there are cases of infectious arthritis which result from focal infection. However as far as typical rheumatoid arthritis is concerned it would appear from this study that chronic focal infection plays a comparatively unimportant rôle. SAMUEL H. KLEIN, M.D.

## DUCTLESS GLANDS

Fana C. Experimental Researches on the Endocrine Function of the Mammary Gland. The Action of Mammary Extracts on the Genital Tract and on the Glands of Internal Secretion (*Ricerche sperimentali sulla funzione endocrina della mammella. Azione di estratti mammari sul tratto genitale e sulle ghiandole a secrezione interna*). *Folia dermatoph. gynecol.* 1938 35: 419.

The action of extracts of the mammary gland on the genital tract and the endocrine system in general has been studied enough in the past years to indicate that the mammary gland takes on the rôle of an endocrine organ. This function was suggested first in 1896 by Bell and others. The author presents a brief review of the literature.

The purpose of the experiments reported was the study of the histological modifications in the genital and endocrine gland and of the importance of the ovaries in the determination of these changes.

Fana noted that mammary extracts stop the estrus cycle in white rats and induce a sudden atrophy of all the tissues in the uterine-ovarian regions. The lining membranes become particularly hypoplastic. In the

guinea pig similar changes are noted. In addition there are degeneration of the ovaries, hypertrophy of the adrenal cortex, hypertrophy and hyperplasia of the thyroid, and hyperplasia of the anterior lobe of the hypophysis. In general, Fana noted that the ovaries must be present in order for these changes to take place. Castration, however, does not modify the changes in the uterus particularly.

Clinically, mammary gland extracts have been of help in the decrease of the vascularity of the utero ovarian regions, as in menorrhagia, fibrosis uteri and subinvolution of the uterus.

A. Louis Rosi, M.D.

**Adler, H.** *The Physiology and Pathology of the Thymus Gland. Clinical Experiments (Physiologie und Pathologie des Thymus. Eine klinisch experimentelle Studie). Deutsche Zeitschr. f. Chir.* 1938 250 614

This is a very interesting, informative, and suggestive work. From Hammar's fundamental morphological investigations, it appears that the size of the thymus has up to the present been generally underestimated. In young persons it is comparatively large with a well developed system of lymphatic glands. In spite of physiological involution, all thymus cell forms were found in extreme old age. We still have no clear understanding of the physiology of the thymus notwithstanding the large amount of work that has been done to explain it. It may be that it contributes growth furthering influences. However, the trephones to which such influences have been attributed are found also in lymphatic gland extracts. That removal of the thymus is followed by a disturbance in growth is affirmed by some investigators and denied by others, but relations to the endocrine organs, the sex organs, the adrenal gland, and the thyroid gland, doubtless exist.

*The thymus gland and myasthenia gravis pseudo-paralytica.* This disease consists of a progressive general fatigability of the skeletal, facial, masticatory, deglutitive, phonatory and ocular musculature, without atrophy or degeneration, and is thus a purely muscular disease. Important for the diagnosis is Jolly's myasthenic reaction, i.e. a tetanic faradic current produces first normal contraction and then rapidly developing fatigability of the muscle. The disease can exist for years. It sometimes shows periods of improvement, but the prognosis is grave because of the possibility of the sudden appearance of paralysis of the muscles of respiration. Recently Walker has shown that improvement lasting for hours can be obtained by the injection of prostigmin. Tumors or hyperplasias of the thymus have sometimes been found, but at the present time the connection remains unexplained. With the thought that there might be a connection with the myasthenia frequent in exophthalmic goiter, Sauerbruch in 1911 removed a thymus weighing 49 gm. from a woman with exophthalmic goiter in whom hyperplasia of the thymus could be demonstrated. The severe myasthenic symptoms disappeared, and one

and one half years later the thyroid gland was removed because of its sudden enlargement. Subsequently von Haberer reported great improvement in the myasthenic symptoms of patients with exophthalmic goiter following removal of the thyroid and thymus glands. The case of a forty year old woman with severe myasthenia who had a tumor of the mediastinum is reported. The injection of prostigmin was followed on every occasion by a sudden improvement in the condition which occurred after a half hour. Sauerbruch removed the tumor. Unfortunately the patient died of empyema and suppuration of the operative wound. Examination of the tumor showed a benign lympho-epithelial tumor of the thymus.

The author reports 5 series of experiments which he himself conducted on dogs. In the first and second it was demonstrated that typical myasthenic phenomena can be produced by implantation of the thymus gland of young dogs or calves. In the third series pieces of calf's thymus were implanted into the peritoneum, either once or repeatedly, and it was found that the myasthenic phenomena could be relieved by prostigmin injections just as in man. The blood serum and calcium levels were controlled in all the animals. In no instance did the lymphocytes in crease or the calcium content show a change for any length of time. Myasthenia therefore has no relation to the change in the blood calcium. In the fourth and fifth series of the experiments, thymus extracts were injected into the vein. They gave rise to immediate myasthenic reactions which were completely relieved by prostigmin, but lasting clinical pictures could not be obtained by the continuous injection of extracts. That the thymus plays a decisive role in myasthenia was therefore proved and anatomical examinations of the musculature showed further that cellular infiltrates in the muscles could not be the cause of the fatigability. Further experiments, described in detail, were made to throw light on the question as to whether hyperactivity of the thymus destroys acetylcholine by means of the irritation of the muscle. This question the author could not decide definitely, but he does explain a mechanism of chemical action. It is certain that the myasthenic disease is of endocrine nature for when the author injected 20 c.c. of defibrinated blood from a patient with myasthenia into a dog a cystic reaction occurred within a few minutes, which reaction disappeared after the administration of prostigmin.

The causes of hyperfunction of the thymus are infectious diseases, diphtheria, angina, and influenza. The author's studies led him to the hypothesis that the thymus possesses a detoxifying function. The irritations of infection bring about a condition of hyperfunction from which there is no recession to normal. It is probable that the long continuing muscular fatigue which follows many cases of angina and influenza may be referred to this cause. As treatment prostigmin is very good but only if given continuously, the disease itself is not cured. Hence, the indication for thymectomy remains if there is de-

monstrable hyperplasia or tumor. Unfortunately the demonstration is difficult. Furthermore hyperfunction need not necessarily produce hypertrophy of the organ. The history is given of a very severe case of myasthenia without demonstrable hypertrophy of the thymus which began two and a half years previously after a severe sore throat and could be only partially relieved by the administration of from 6 to 12 tablets of prostigmin daily. The right lobe of the thymus was removed by Sauerbruch with almost no bleeding by means of a deep collar incision and extirpation of the organ under traction and with the aid of forceps of the thickness of the little finger. One hour after the operation the patient showed improvement. After 19 hours she could raise the eyelids to almost the full extent. This favorable condition remained for fourteen hours. After this period some of the improvement was lost but at the end of three weeks she was able to take long walks and could do needlework without any disturbing fatigue. On the other hand there was considerable ptosis and the muscles of the face of mastication of deglutition and of phonation continued to tire easily so that prostigmin had to be given at midday and in the evening to make it possible for sufficient nourishment to be taken. However in comparison with her previous condition she is much improved. Removal of the remaining left lobe of the thymus after division of the sternum is being considered.

*The thymus and myotonia.* It followed from the above related experience that myotonia or Thomsen's disease might be regarded as resulting from hypofunction of the thymus. A typical case history is reported. The author injected thymus extract and obtained light but distinct improvement which however lasted only between three and four hours. Further experiments were not made because of the fear that the preparation as obtained from the slaughter house might not be sterile. Intravenous injection of quinine was then given (2 cc. of 25 per cent quinine hydrochloride, Bayer). There was a prompt response which lasted for a few hours (as was reported by Foster Kennedy and Alexander Wolf). Experiments on dogs made by the author also produced support for the hypothesis of hypofunction or dysfunction. Dogs were rendered myasthenic by intravenous injections of quinine but in contrast to dogs made myasthenic by thymus extract they were not restored to normal by injection of prostigmin. Further investigations are necessary to clear up this question.

*The thymus and Addison's disease.* Hyperplasia of the thymus sometimes but not always found in Addison's disease. In future patients with Addison's disease should be tested for the myasthenic reaction.

*The thymus and exophthalmic goiter.* The incidence of hyperplasia of the thymus in exophthalmic goiter varies between 60 and 100 per cent. In Sauerbruch's clinic it was found in all of the 13 patients who died from this disease over a period of nine years. Von Haberer holds that it plays a decisive role in the fate of the patient and with suitable findings always recommends thyrectomy. Opinions vary as to how the thymus acts in exophthalmic goiter. Since hyperfunction of the thymus can be present without hyperplasia it became of interest to know when myasthenic symptoms existed in exophthalmic goiter whether the myasthenic reaction could be demonstrated and disappeared after operation on the goiter. Twenty case histories are related. The myasthenic reaction was present in 12 in 6 of the 7 cases in which the reaction was sought for in a follow up examination after operation it was absent. From this it appears beyond doubt that myasthenia and consequently hyperfunction of the thymus exists in a considerable number of patients with exophthalmic goiter. Thereupon the author decided to administer prostigmin (2 tablets 3 times daily) to a seventeen year-old girl with exophthalmic goiter and a myasthenic reaction in whom it had been impossible to obtain improvement in spite of continuous treatment with diiodotyrosin, gynergen and quinine for four months preceding. In seven weeks the patient made very rapid improvement with a gain in weight of 8 kgm. The goiter was then removed. There was a very severe reaction followed however by rapid recovery. At the end of two and one half months she was fully able to work. The myasthenic reaction was negative. This change could have been a matter of chance. It must further be determined whether the thymus hypertrophy really has a detoxifying influence even though it gives rise to myasthenia. Therefore the author now attempts to intensify the hyperplasia of the thymus with thymus extract in patients with very severe exophthalmic goiter. The matter is not yet clear. Nevertheless these considerations have led to the performance of thyrectomy at the time of the goiter operation in patients with exophthalmic goiter and the myasthenic reaction. This has been done three times already. In all the course was remarkably favorable despite the bad previous condition of the patient. The theory formulated at the Sauerbruch clinic is as follows: any increased activity of the thyroid stimulates the internal secretion of the thymus. In exophthalmic goiter this stimulation is inordinate because of defective central control and the excessive thyroid function finds expression in the myasthenic reaction. In some cases this overactivity ceases after removal of the goiter in other cases it does not.

(FRANZ) FLORENCE A. CARPENTER

# INTERNATIONAL ABSTRACT OF SURGERY

AUGUST, 1939

## PRINCIPLES OF SURGICAL PRACTICE

### ROUND TABLE CONFERENCE

### INFECTIONS IN SURGERY

MONT R REID, MD, FACS Cincinnati Ohio

IN order to discuss intelligently the problem of "Infections in Surgery," it is first necessary to determine the causes of the infections. Strictly speaking, the correct answer is "bacteria," but from a practical point of view that answer is far from satisfactory. There can be bacteria in a wound or tissues with no clinical evidence of an infection. There can be local and general reactions to a wound, without suppuration, which may or may not be due to infection with bacteria. Again there may be suppuration in a wound without any evidence of invasion of that wound by bacteria. Many wounds containing bacteria will heal without any evidence of infection, while others supposedly free of them will develop the most virulent infection. Thus, the practical problem of infections in surgery is not so simple as the presence or absence of bacteria in the wound or tissues. There are many other factors which come into play in the determination of whether or not infection may occur.

As a matter of fact, there are now very few of us who believe it possible for a wound, either closed or left open, to be absolutely free of the presence of any bacteria, and this holds true for planned or surgical wounds as well as traumatic wounds. Then there must be factors other than the presence of bacteria, which have a marked influence upon the problem of infections in surgery. Today it is our plan to discuss some of them, as well as the part which bacteria play.

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In the early years of my career I witnessed many contradictions to my belief at that time in the absolute asepsis of wounds. They worried me because, to my surprise, infection rarely occurred. However, as I now recall, the 'breaks in technique' were usually committed by masters of the technique of operating. I need not recall to this audience the errors in sepsis committed by Ochsner, Murphy, and many other great surgeons who rarely were annoyed by infected wounds. Yet, I do want to relate one personal experience which made a great impression upon me. Shortly after graduation from the medical school it was my exceptional privilege to assist Doctor Wm S Halsted in some experiments upon the large abdominal blood vessels of dogs. I would have the field of operation prepared with the most meticulous asepsis when he arrived in the laboratory. Frequently he would stop to discuss some new ideas which had occurred to him or me since the last experiment, during which time he gave his hat, cane, coat, and shirt to the diener. Finally, absorbed in his thoughts he would 'scrub up,' which procedure on such occasions might appear to me to take an exceedingly short time. Then finding himself without cap and mask he would dry his hands on a laundered but unsterilized towel and carefully put on the cap and mask, after which he would put on his gloves and gown and be ready to operate. Or if he was unusually absorbed in thought he might smoke one or two cigarettes between scrubbing up and putting on gloves, in order to discuss further new ideas.

before beginning the work. I was young and anxious and naturally trembled at the thought of infected wounds. Yet in a series of more than 100 abdominal experiments there was not a single infection and a year or more after an operation it was scarcely possible to see any abdominal scars. I believed in asepsis then as I do today and wondered why, with such obvious breaks in technique "we did not get infected wounds. I was then obsessed with the idea of absolute asepsis and for some time did not fully appreciate the other things I was learning—things which with the passing of years have loomed very large in my mind as factors which often determine the incidence of infections in surgery. At this point let me say that Doctor Halsted never operated upon a human being with any greater care than when operating upon animals. At times he may have seemed very impersonal but so far as I know he never performed an operation on man or beast which was not done with the most perfect operating technique at his command and my experience with him convinced me that any surgeon who believes that he can use an inferior technique when operating on animals is running a serious risk of impairing his skill as a surgeon.

In those early days in the laboratory everyone at the operating table including the anesthetist had his nose and mouth securely masked. Gloves were filled with a solution of bichloride of mercury before they were put on in order that the presence of any holes in them could be detected. The field of operation was covered with sterile Japanese silk soaked in collodion which when dry would adhere to the skin and allow the incision to be made through it. With this precaution hands, instruments and sponges never came in contact with the animal's skin. Doctor Halsted handled all tissues with the gentleness of a true artist's touch. I wiped a wound just once since then my efforts to remove blood from a wound have been confined to the gentlest sponging, aspiration or flushing with normal salt solution. Frequently when it was necessary to pack the intestines out of our way they were first covered with thin rubber protective. If Dr Halsted had any doubt about the sizes of silk which had been prepared for his use he would send for samples from the stock room and if a mistake had been made he would wait until he got the very fine grade he wanted. All blood clots and detached bits of tissue were carefully removed. Fragments of tissue connected by stalks which might not nourish them were cut away. Sutures which by chance were tied too tightly were removed and

replaced by looser ones. Sutures were not placed in muscle or fat. Tissues deprived of their blood supply and doomed to death by reason of a ligature were trimmed back close to the ligature. He always used a knife for dissecting for he believed it less damaging to tissues than scissors. After the peritoneum was closed the wound was frequently irrigated with salt solution in order that surface bacteria, tissue juices and dissolved fat be washed away. He was disappointed if any part of a wound looked blood stained, contained hematomas or in any way looked 'chewed up' or traumatized. After having begun an experiment he would continue to work until he had closed the skin with the most meticulous care. I believe this was because of his great interest in wound healing although he always had in mind his responsibility in the training of men who were working with him. Whenever a wound was reopened within a couple of weeks he was greatly interested in its appearance, the amount of necrosis and the appearance of the granulation tissue even though there was no infection.

With my sincere apologies for this rather lengthy description of my own experience with Doctor Halsted I shall attempt to reduce what I learned from him and what little else I may have learned in the near quarter century since then to a few general principles.

- 1 Infections in surgery are not by any means due solely to the presence of bacteria in the wounds for absolute asepsis is rarely if ever obtained.

- 2 Efforts to observe a rigid asepsis are perhaps the most important factor in the control of infections in surgery but with our present knowledge do not justify the use of means which do damage to healthy living cells.

- 3 Healthy living tissues have a remarkable capacity to kill bacteria and since we admit a doubt of absolute asepsis of any open or made wound it is our duty to endeavor to free those tissues of any other handicaps which may make it impossible for them to cope with bacteria which may be present. Among the handicaps which may make a wound which would otherwise heal per primam become infected are

- 1 Debris, blood clots and dead or devitalized tissue. The substances not only put an extra burden upon the living cells which must grow and heal the wound but are also excellent food for the growth of bacteria which are present.

- 2 Poor or improper nourishment for the cells which must repair the wound.

Today we can discuss only a few of the aseptic and antiseptic precautions and procedures of

technique which, by reducing the burden upon the living cells that must heal the wound, may materially aid in the reduction of infections in surgery.

Doctor Allen O. Whipple will make a few remarks concerning the part which the choice and use of ligature and suture materials may play in the incidence of infected wounds.

Doctor Arthur Allen will give us a brief discussion of certain measures and procedures which may aid in providing the living cells with the most

ideal food with which to do their work of healing a wound.

Doctor Michael Mason will give us a brief evaluation of the use of aseptic and antiseptic measures as they may affect the incidence of infections in surgery.

Doctor Urban Maes will discuss for us the subject of control of hemorrhage in fresh wounds and delicate granulation tissue, and the influence this may have upon the incidence of infections in surgery.

## THE CHOICE AND USE OF LIGATURE AND SUTURE MATERIAL IN THE REPAIR OF CLEAN WOUNDS

ALLEN O. WHIPPLE M.D., F.A.C.S. New York, New York

**A**S surgeons we have to make incisions and repair wounds in our approach to diseased tissues and organs. We should be as much interested in ideal wound healing as in any one subject in surgery. It is only by studying wound healing processes and keeping ever an open eye and mind to the factors entering into these processes that we can improve our results and be discontented with what we had considered good in the past.

Doctor Reid has asked me to discuss the part which the choice and use of ligature and suture material may play in the incidence of infection in clean wounds.

In the repair of a clean incised wound the following factors are of prime importance:

1. Dissection with a sharp knife
2. Complete hemostasis
3. The maintenance of as sterile a field as possible
4. Protection of the wound edges with towels, and exposed surfaces with moist abdominal pads
5. The use of as fine ligature and suture material as possible with not more than twice the tensile strength of the tissue in which the ligature or suture is placed
6. Minimum trauma with the maximum maintenance of the blood supply and nutrition of the tissues

If these criteria are met, the incidence of infection in clean wounds can be reduced to 2 or 3 per cent and by constant effort and vigilance it can be made to approach the vanishing point. How

ever, beware of the surgeon who says he never has infection in clean wounds.

I wish to discuss the fifth point, i.e. the choice and use of ligature and suture material. If one delves into the history of suture material since Lister made elective surgery possible, one will find that there was a trend in the seventies and early eighties of the last century to use catgut because of its absorbability, and because silk and linen, as then used in heavy grades, resulted in prolonged sinuses and infected wounds. However, in the hands of careful observers like Kocher, catgut resulted in wound infection in from 70 to 80 per cent of the cases. Kocher and a few other German surgeons changed over to fine silk with great relief and satisfaction. Halsted, who had observed Kocher in the early eighties, understood the underlying philosophy of silk technique and introduced it into the Johns Hopkins Clinic.

With the improved methods of sterilizing catgut, the serious infections, especially the anaerobic, were largely eliminated, and the majority of surgeons, not knowing how to use silk properly, wisely continued to use catgut as a suture material. However, with the growth of follow up study in this country and the spread of a more critical attitude regarding surgical results in our best clinics, the subject of primary wound healing has been receiving more and more attention. No longer are we satisfied with impressions as to the percentage of infections in our clean wounds. Weekly, monthly and annual tabulation of the individual case histories is now including figures on wound healing, and this has had a most salutary effect on our attitude toward wound repair.



Catgut has the advantage of absorbability but in this quality there is a wide variation as to rate and time of absorption. Many factors such as the type of catgut and its chemical preparation by commercial manufacturers and the contact of catgut with gastro intestinal ferments necrotizing organisms and allergic reactions have made surgeons fearful of finer grades of catgut. As a result heavier grades are used which require the use of large needles and hemostats heavy instruments in general. In order to set and secure the knots much force is required therefore there is a tendency to include too much tissue in the artery clamps and large masses of tissue in the suture line are deprived of blood supply because of the excessive tension in the continuous sutures. One sees Kocher clamps used as hemostats in many clinics and double No. 2 or No. 3 chromic catgut for a continuous suture in the repair of abdominal incisions—grades of sutures which are known to be from fifteen to thirty times stronger in tensile strength than the tissues which they are supposed to repair.

Catgut placed in the tissues absorbs fluid from the tissue swells and causes still more tension. This tension is quickly equalized by pressure necrosis so that within a day or two the suture rests at the inner end of an ellipse of necrotic tissue and the tighter the suture has been tied the longer the ellipse. Furthermore catgut acts as a culture medium for bacteria entering the wound and it pour cultures are taken from experimental wounds made by parallel rectus incisions in which catgut is used on one side and silk on the other the number of bacteria in the catgut side will invariably be found to be greater than that in the silk side. In addition to the bacteria necrotic devitalized tissue is in excess an infection will be much more apt to develop.

If catgut could be used in as fine grades as it is possible to use silk the difference in wound healing with the two materials would probably be slight. However silk can be used safely in such fine grades both for ligatures and sutures that the critical surgeon will adapt his team his instruments and his entire technique to the stronger and more delicate medium.

One should not attempt to use silk unless he is willing to change his technique and instruments. Silk should be used only in the finest grades and it cannot be used with heavy hemostats heavy needles and with the same amount of tissue inclusion in the ligature and suture line that one sees in clinics where catgut is used routinely. In this lies the essence and the philosophy of silk technique for its use connotes minimal tissue

damage and maximum maintenance of nutrition to the wound edges.

It requires more time because the technique is more meticulous. Interrupted sutures rather than continuous-layer sutures a more careful hemostasis with more fine ligatures a constant effort to tie the sutures without tissue tension these are all factors which develop in the critical surgeon a more deliberate attitude to accomplish a better repair.

I was not trained in the Halsted School but the men with whom I had my early training in surgery—Clarke Blake Martin and Lambert—were all intensely interested in wound healing and constantly emphasized the importance of minimal tissue damage. However it was not until I adopted the use of fine silk in all clean wounds—and now in many potentially contaminated wounds—that I realized the possibilities of ideal wound healing. Since silk has been adopted by the men trained in its use in our clinic the improvement in our wound healing has been so striking as to leave no room for argument, as to both immediate and late results.

TABLE I—THE INCIDENCE OF SUTURE MATERIAL AND THE TYPE OF SUTURE USED IN THE ANTERIOR SHEATH

Material	% of cases	F & N suture	Pl in suture
Silk	300	225	72
Catgut	187	10	79
Control	300	0	100
Total	887	335	451

Cases in which total growth rate increased with treatment

TABLE II—INFECTION IN CLEAN OPERATIVE WOUNDS

Material	% of cases	1st day	2nd day	Per cent	Total	Per cent
Silk	199	4	2 04	0 0 0	1	2 04
Catgut	25	1	4 00	0 0 0	1	4 00
Total	224	5	2 22	0 0 0	2	2
Control	53	4	7 52	2	3 77	6 11 32

TABLE III—INCIDENCE OF DISRUPTION

Material	F & N suture	Per cent	Pl in suture	Per cent	Total	Per cent
Silk	1	0 44	0	0 0	1	0 33
Catgut	4	3 02	1	2 6	5	2 6
Total	5	1 51	2	0 66	6	1 25
Control	13	4 34	13	4 34		

Two cases in which the wound healed without separation of the wound margins. In the first case the wound healed without separation of the wound margins. In the second case the wound healed without separation of the wound margins. (Whipple, A. O. and Ellis, R. H. E. J. The Repair of Abdominal Incisions. A. N. S. 935, 08, 741.)

## NUTRITIONAL FACTORS INFLUENCING WOUND HEALING

ARTHUR W ALLEN, M D, F A C S, Boston, Massachusetts

THE rapidity of wound repair in the healthy, well nourished individual, as compared to the slow unsatisfactory healing often observed in a patient in a deficiency state, makes it necessary to bear in mind certain precautions in this respect. Too often we deal in generalities as regards the type of skin preparation, aseptic technique, trauma, and suture material without taking into consideration the effect of age, disease, and biochemical faults on cell proliferation. The majority of wounds occur, or are made, in the comparatively normal, healthy person, and we are prone to base our experience on the way and manner which such wounds heal as a standard for all surgery. Thus, we find our interns removing sutures on the seventh day with complete assurance regardless of the disease for which the patient was operated upon or his state of nutrition, as since the accepted time for healing has elapsed, there should be no doubt concerning the state of repair. They are inclined to accept dehiscence as an uncontrollable disaster or an Act of God which of necessity must occur in a small percentage of cases. Before nutritional states were understood and the effect of these on wound repair was known we learned by experience that in the very young, in the aged, and in patients who had been operated upon for gastro intestinal carcinoma, a careful wound repair, with non absorbable sutures placed through skin, fat, and fascia, and tied loosely, could be safely left in place for two or three weeks with the avoidance of many unnecessary wound disruptions. We realized that for some reasons, then only partially understood, repair under certain circumstances was retarded. Much has been learned concerning these factors in recent years, and by correcting certain chemical faults, fluid balance, and deficiency states, one can expect repair to take place in a more normal manner.

The division between chemical faults and nutritional states cannot be a sharp one since often they are found together, or one is dependent upon the other. It may be best to consider the problem more or less in a general manner. In many patients requiring surgery, there is no emergency and plenty of time may be spent in correcting existing deficiencies prior to operation. Often

this can be accomplished only partially because of the effect on the individual of his primary lesion, but certainly all practical preparation should be carried out and every known helpful procedure utilized. When it is obvious that no further improvement in the patient's condition can be expected, then the choice of operation must be considered. If the situation is one that can be handled more safely by stage operations, then it should be so planned. Often a preliminary short circuit or proximal bowel drainage may be done, which may allow a more complete correction of the existing faults before the lesion itself is attacked. A preliminary jejunostomy, for feeding in patients unable to take adequate nutrition by mouth often allows one to accomplish a serious operation with greater safety. In those individuals requiring an emergency procedure, one must combat the chemical and nutritional faults as vigorously as possible immediately and carry these adjunct procedures along until health is restored. One looks back on many patients whose lives were lost, in spite of an excellently accomplished surgical operation, because of the lack of understanding of the effect of deficiency states on repair.

Water imbalance is perhaps the most frequent serious fault encountered and fortunately the easiest to correct. With fluid loss the chlorides in the blood are often low, particularly when this has taken place through vomiting. Thus, salt and water can be replaced by clysis or by intravenous solutions. Glucose affords the simplest and most effective means of artificial nourishment of the cell and in many cases one needs only to administer in the correct manner a suitable amount of water, salt and sugar.

One should, in patients who have been ill a long time and those with certain depleting disorders, take other known factors into consideration. Anemia should be corrected by blood transfusion in the acute cases. Liver and iron will help in the more chronic states and aid in maintaining a normal blood level during the recovery from acute blood loss. Often one finds a low protein level in the blood and this situation will affect wound healing materially. Certainly many of the malfunctioning stomas in the gastro intestinal tract are due in large part to the edema coincident with hyperproteinemia. One sees evidence of this

in the healing of superficial wounds and of surgical incisions as well. So far the only satisfactory method of combating this situation in the acute stage is by blood transfusion. If one can arrange for the absorption of protein from the intestine by feeding this substance by mouth or through a jejunostomy as early as is practical a more normal state can be obtained.

The effect of vitamins on deficiency states and thus on wound healing is now established. There is considerable experimental and clinical evidence that *Vitamin C* is particularly important in this respect. The ascorbic acid level in the blood

can be determined by laboratory test. Frequently time or facilities do not allow for this procedure. Since it has been shown that the unusable excess of cevitamic acid is safely excreted through the kidneys it seems justifiable to use the substance empirically by mouth and by the intravenous route in surgical patients who may have been on a deficient diet prior to operation or who, by reason of their surgical lesion cannot resume a normal diet at an early date after operation. It is likely that the other water soluble vitamins, particularly nicotinic acid, may also be proved of importance in wound healing.

## ASEPTIC AND ANTISEPTIC MEASURES AS THEY AFFECT THE INCIDENCE OF INFECTIONS IN SURGERY

MICHAEL L. MASON M.D., F.A.C.S. Chicago, Illinois

THE discussion of surgical infections at this noonday conference has emphasized those factors which promote or interfere with wound healing and which discourage or favor the development of infection. It has been pointed out that bacteria are present in practically every surgical and accidental wound and that whether or not they produce infection depends upon the ability of the body cells to resist them. It is generally agreed that every effort should be made to free wounds of bacteria and prevent bacteria from entering them but the measures taken should not harm the tissues the healing of which we are trying to promote. Whether or not we can accomplish this removal will depend in general upon two factors: the length of time which has elapsed since the bacteria were introduced into the wound and the degree of acclimatization of these bacteria to growth in human tissue fluids.

We have come to distinguish clinically between wound contamination from natural extraneous sources and contamination from human sources and in our examination of a patient with an open wound we try to ascertain the possible sources of the bacteria with which his wound is contaminated.

When bacteria from natural extraneous sources are introduced into wounds they do not at once

begin to proliferate; they require a certain amount of time to adjust themselves to growth in the human medium. This time interval probably varies with different bacteria and different tissues but in general some time between the fourth and sixth hour after inoculation bacterial growth starts. During this period of time the bacteria apparently lie on tissue surfaces and may be looked upon as mere contaminants amenable to removal. After this period of acclimatization has passed bacterial growth has started; tissue reaction will have begun and the wound instead of being simply contaminated is infected.

Obviously every open wound so contaminated does not become infected even if no measures are taken to prevent it or to remove bacteria from it. Equally obvious is the fact that many wounds even under ideal treatment and conditions do become infected. However it is logical to attempt to rid the wound of the contaminating bacteria before growth and proliferation have started that is within the first four or at the most, six hours. The temptation has been to pour various sorts of antiseptics into the wound in the hope of destroying the germs. This illogical practice has persisted in some form or other to the present day even though the goal of an antiseptic which harms only bacteria has never been attained. Not only does the use of antiseptics fail to destroy all of the living organisms but more important still it injures the living cells so that they are less able to cope with the bacteria that are left behind.

It is more logical and efficacious to rid wounds of bacteria mechanically, in such a way that the tissue cells may not be harmed. Friedrich, on the basis of his experiments, suggested that wounds be completely excised within from four to six hours after they have been incurred. Without doubt, this method of complete wound excision is efficacious; however, it is not universally applicable nor is it necessary, and excision should be restricted to the removal of tissue of which the vitality has been so lowered by the trauma that it cannot survive.

Contaminating organisms from natural extraneous sources in that vegetative condition in which bacteria find themselves in the external world may be removed from wounds and washed from tissue surfaces within from four to six hours after the injury by the conscientious use of soap and water and irrigation with normal saline solution. This procedure thoroughly carried out under aseptic conditions, first by washing the surrounding skin and then the wound for at least ten minutes each, does not harm the tissues and leaves us with a wound that is surgically clean and amenable to repair and closure.

When we come to consider the wound contaminated directly or indirectly from human sources the situation is different. Bacteria which are introduced into a wound from the fingers, from the respiratory tract of the examining surgeon or bystanders, from instruments hastily taken from the doctor's bag, from unsterile instrument trays in the emergency room, from a knife or needle used in a post mortem examination or from human bites belong in a different category. Such organisms are not only often extremely virulent, but they are already acclimated to human tissue and grow almost at once after they have been introduced. Wounds so contaminated must usually be considered to be infected at the time of inception. So far as I know, no one has established the exact time limit within which immediate cleansing would be efficient. Certainly the pouring in of antiseptics has not helped and early operation has never been anything but disastrous.

I think this distinction between natural and human sources of contamination has a very direct bearing upon our management of open wounds, and I should like to cite briefly two illustrative instances.

A boy of six was playing in an alley and sustained an extensive laceration of the wrist from a broken bottle in a rubbish heap. He was seen within a very few minutes by his uncle, a doctor, who simply covered the wound with a sterile

dressing. The boy reached the hospital within an hour, when the dirt contaminated wound was washed with soap and water, and irrigated with normal salt solution. An extensive nerve and tendon repair, lasting over three hours, was performed. The wound healed by primary intention and with complete return of function of all of the divided structures.

A man of thirty-eight slipped on the stairs and in falling thrust his right hand through a window and sustained two lacerations of the wrist. The wound bled furiously and the physician who was called applied hemostats and ligatures to the radial and ulnar arteries. The patient was then taken to a nearby hospital where the wound was cleansed in the emergency room and additional ligatures were applied. He reached the operating room in less than four hours after the injury. There was no gross contamination and a lengthy primary repair seemed justified. Twelve hours after operation, however, the temperature suddenly rose to 104 degrees and the patient presented the picture of extreme toxemia. The whole wound had to be re-opened and other measures taken to combat the infection. Luckily, the patient survived, but with extreme loss of tissue.

With one exception, both cases were treated in like fashion. In each, the wound was washed and repaired by the same surgeon, in the same manner. The wound which was grossly contaminated with dirt from the alley rubbish heap healed with out reaction and with complete functional recovery. The other, a clean laceration from a window pane, developed a life-threatening infection with serious loss of tissue. The only essential difference in the management was the nature of the first aid. In the case of the boy, the wound (dirt and all) was simply covered with a sterile dressing bandaged on snugly, which was not removed until the patient was in a well-equipped hospital and all precautions had been taken to prevent secondary contamination. In the case of the man, considerable first aid had been rendered, first in the home, probably with several unmasked spectators about and again in the emergency room where ample opportunity had been afforded for contamination from human sources.

It has come to be my feeling that many of the wound infections which we see are not due to the organisms which get into the wound at the time of the injury, but to bacteria which are introduced during efforts at first aid. Copious hemorrhage, anxious relatives and friends, insistent demands for immediate treatment often lead the physician or first aid man to do things which cause irreparable damage.

We teach our students that first aid of open injuries should be simple. The wound should be covered with a sterile dressing bandaged on snugly, a splint applied right away will minimize secondary mechanical damage and will add greatly to the comfort of the patient. Antiseptics should not be poured into the wound at this or at any other time. Upon reaching the hospital all inspection of the wound should be carried out under the same aseptic precautions that one would use in any aseptic procedure. The mouth and nose should be masked, instruments should be sterile, hands should be scrubbed and rubber gloves should be worn. It is needless of course to add that the operative repair of the wound should be done with the same care and aseptic technique that is accorded the clean operation.

The organisms from natural sources introduced at the time of the injury, may usually be washed from the wound provided it can be seen within the four to six hour period and the wound may be repaired and closed. The organisms introduced by unsterile hands, droplets contaminated instruments from unclean medical kits and unsterile dressings contaminated from human sources cannot be removed. Wounds containing the latter must be considered to be infected and must be so treated. When a patient presents himself with an open injury it is very important to inquire carefully into the nature of the first aid. A few minutes spent in questioning impatient friends and relatives may save the surgeon a great deal of embarrassment, and the patient a stormy period of infection.

## THE INFLUENCE OF CONTROL OF HEMORRHAGE AND PROTECTION OF DELICATE GRANULATION TISSUE IN WOUND HEALING

URBAN MILES, M.D., F.A.C.S., New Orleans, Louisiana

WHEN two-stage operations are demanded in the best interest of the patient, the surgeon must forget his halting average and abandon hope of primary wound healing. On the other hand, all surgeons aspire to a high ratio of primary wound healing and must keep in mind certain fundamental principle to attain this objective. Others on the program will consider the patient himself and the equipment used in the operation. I shall confine my remarks to certain specific facts concerning the wound.

The statement that every surgical operation is an experiment in bacteriology implies that all wounds contain bacteria. This is true. It is impossible to eliminate all sources of contamination. Even when all other sources are eliminated, bacteria are inevitably liberated during the course of the operative procedure from the depths of the sweat glands and hair follicles. The aim of the surgeon must therefore be to keep the tissues in the best possible condition to take care of the

bacteria which will be present despite the most meticulous asepsis.

The normal process of repair reduced to its ultimate simplicity consists of two steps: (1) the formation of fibrin which literally glues the edges of the wound together, and (2) the proliferation of vascular buds and young fibroblasts, the complete organization of which results in the formation of adult fibrous tissue or scar tissue. The permanent healing of all wounds depends upon these two processes.

The small thin scar with nearly exact approximation of like tissues is the ideal to be achieved. The granulations in the wound must therefore be protected against trauma which injures the growing cell. The interposition of any material which prevents accurate contact of the wound surfaces must be avoided. Infection which injures the growing cells and prevents accurate contact of the wound edges must be prevented. Finally, mechanical separation of the wound surfaces must also be guarded against, the most frequent causes of this accident are the presence of blood clots, accumulations of serum and devitalized tissue.

In the normal process of repair when the space between the two wound surfaces has been

From the Department of Surgery, Louisiana State University School of Medicine and the Charity Hospital of Louisiana at New Orleans.

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bridged by healthy granulation tissue and all debris has been absorbed bacteria can no longer grow and produce infection because of the high degree of immunity exhibited by young fibroblasts and angioblasts. If, on the other hand, the accurate apposition of the healing surfaces is prevented by the presence of blood clots, serum, or devitalized tissue then excellent culture media are provided on which bacteria may grow unchecked and from which as a nidus, they may invade surrounding living structures.

The care of wounds at the time of operation calls for the strict observance of several fundamentally important rules.

- 1 A clean deliberate incision must be made with sharp instruments which means that dissecting scissors and blunt dissection are to be employed as little as possible.

- 2 Hemostasis must be adequate. Vessels must be clamped and ligated with as little suture and ligature material as possible. All sutures, whether catgut or silk, are foreign bodies and the presence of foreign bodies militates against primary wound healing.

- 3 The area in which the wound is located must be immobilized and kept at rest. Failure to observe this rule is followed by the formation of hematomas and the accumulation of a serous gneous fluid, which usually make their appearance just when the patient is apparently well and is ready to be discharged from the hospital.

The use of local anesthesia plays a more important part than is generally realized in the failure to achieve primary wound healing. In a study made some years ago on operations for in-

guinal hernia, I pointed out that the percentage of failures in primary wound healing because of the development of infection was materially increased when a local anesthetic was used. The wound is dry at the time of closure, probably because of the use of adrenalin to hold the anesthetic solution in the tissue but when the effect of the adrenalin has disappeared, a small amount of bleeding occurs. Thus, as I have already pointed out, pabulum is furnished for the growth of bacteria, wound healing is delayed, and the scar tissue that is formed is greater than the normal amount.

In our studies of wound disruption in abdominal operations we have been able to find no single factor responsible for this catastrophe. The age and condition of the patient play their part, but are not adequate explanations. Suture material may be partially responsible, but in many instances it is possible to demonstrate that the tissues themselves give way, and not the material used to approximate them. Vitamin and plasma protein deficiencies are present in some cases, and introduce the thought of a constitutional factor. However, none of these factors in my opinion, overshadows the importance of inefficient hemostasis which permits the formation of hematomas, the collection of serum and the devitalization of tissue.

The frequency of wound infection and wound disruption will be diminished by careful hemostasis by the use of the finest suture material, and by the ligation of vessels with as little surrounding tissue as possible. Perfection of technique is our aim, but it has not yet been achieved.

## QUESTIONS AND ANSWERS

**Question** Does the Wangenstein suction apparatus help to reduce the incidence of abdominal infections?

**DR REID** Anything which will reduce abdominal distention and thus take tension away from the abdominal wound will certainly lessen the amount of necrosis from the sutures and thus reduce the incidence of infection. I am sure that all of us recall instances of abdominal wounds which healed per primam and yet developed a large postoperative hernia. In many such cases marked abdominal distention tightens the sutures and produces an extensive necrosis, even though the wound apparently heals per primam. I certainly believe that the wise use of the Wangenstein suction apparatus will definitely prevent infection of many abdominal wounds.

**Question** Does the use of the electric high frequency current knife make the wound more liable to infection or slower healing?

**DR REID** There is a strong temptation for the operator to use the coagulator too freely in the control of hemorrhage and thus leave in the wound a very large amount of unnecessary dead and damaged tissues. From such a careless use of it no doubt there result many infections. I have seen some wounds so charred by its free usage that they looked to me as if they should be given a careful debridement before closure. I personally feel that the actual amount of tissue necrosis is usually greater from coagulation than from the careful use of small ligatures. Besides as I have said when one is using ligatures he will not likely be unnecessarily so many bleeding.

points as he will coagulate if he is using the coagulator

**Question** What part do you think anesthetics play in infections in surgery?

**DR REID** In abdominal surgery I think they play a very important part. The surgeon must as a result of a poor anesthetic fight the intestines and use strong retraction. There can be no question but that the amount of trauma will be greatly increased and trauma, as you know, predisposes to infection. I would personally rather delay opening of the abdomen for from twenty to thirty minutes if necessary, in order to have a quiet smooth period of anesthesia than open the abdomen earlier and have to contend with the patient's struggling during the procedure of operating. In surgery in other parts of the body straining may not be such an important factor in leading to necrosis but there is the feeling of many people that anoxemia over a long period of time definitely reduces the ability of the tissues in the wound to combat infection.

**Question** Do you believe in the surface washing of so-called aseptic wounds?

**DR REID** It is very difficult for the operator to detect with his eyes bits of detached tissue and I believe that it is very important to wash nearly all wounds before closing them. We have done this for many years and are constantly surprised by the large amount of dissolved fat and bits of tissue which can be recovered from a wound which appears to be clean. Besides we have the feeling that a careful washing with normal salt solution poured into the wound from a considerable height will remove a large majority of the surface bacteria which always get into a wound. We know this is true because we can usually get a bacterial culture from the washings of any wound. The washing also floats up bits of muscle and tissue which are attached by such tiny pedicles that probably they cannot survive. Most of the debris can thus be recognized and removed.

**Question** Do you use silk in dirty cases for example in a ruptured appendix?

**DR WHIPPLE** Silk should not be used in cases in which purulent exudate or infected tissue is anticipated especially in the closure of incisions requiring drainage of an intestinal abscess.

**Question** Would you advise using a fine running catgut suture in the peritoneum then silk closure outside?

**DR WHIPPLE** As a rule silk and catgut should not be used in the same abdominal incision. However in the peritoneum catgut can be used for the peritoneum and posterior rectus sheath with interrupted silk for the anterior sheath be-

cause of the separation of the two by the muscle layer. Fine silk in the peritoneum will give a more secure closure with less chance of a disruption or postoperative hernia.

**Question** Is silk used on all abdominal cases as appendectomy, cholecystectomy?

**DR WHIPPLE** I use silk in interval appendectomy and in cholecystectomy for chronic cholecystitis.

**Question** How do you measure the force with which ligatures and suture should be tied?

**DR WHIPPLE** If interrupted fine silk sutures are used at 1 cm intervals the repair will be adequate. The sutures should not be tied tighter than to approximate the tissues and the suture should be so fine as to break easily if the tissue is more than approximated. Silk should not be used if the operator cannot tie it without its breaking with undue tension on the tissue. This applies to ligatures as well as to sutures.

**Question** What is your opinion of alloy steel wire as a suture material?

**DR WHIPPLE** Alloy steel sutures are from 10 to 30 times stronger than the tissue in which they are used. Non absorbable sutures do not need to have more than twice the tensile strength of the tissues which they approximate. A suture as strong as steel wire encourages tight tying and the strangling of the tissue in which it is used. I can see no advantage in the use of steel alloy except for the through and through suture for closing abdominal incisions with infection present.

**Question** How do you feel about the prevalent use of sutures in fat and muscles?

**DR WHIPPLE** Fat and muscle are so easily cut through by pressure or tension necrosis that attempts to approximate them for more than a few hours are futile. Careful hemostasis and closure of the wound by suture of the fascial and aponeurotic layers and skin accomplishes all that can be done and reduces the amount of foreign body suture material.

**Question** What size silk is used in closing an abdominal wound?

**DR WHIPPLE** In the repair of clean abdominal wounds a silk with the tensile strength of 3 pounds is used for the peritoneum and posterior rectus sheath a similar grade for the anterior rectus sheath in interrupted sutures at 1 cm intervals and No. 1 for the skin in silk interrupted sutures.

**Question** What do you think of through and through sutures with for example silk worm gut?

**DR WHIPPLE** For several years I have given up through and through retention sutures for the closure of clean abdominal incisions. I use

steel alloy wire or No. 1 silk through all the layers of the abdominal wall, including the skin, at from 1 to 2 cm intervals in closing grossly contaminated incisions, especially when cough, distention, vomiting, or hiccough is expected.

*Question* How about the use of sulfanilamide as a prophylactic in peritonitis?

DR ALLEN I have had no experience with the use of this drug in the treatment of peritonitis, nor am I aware of any report on the subject. Peritonitis is rarely caused by the beta hemolytic streptococcus. Rarely does the gonococcus cause a death from peritonitis. I believe that most of the organisms causing fatal peritonitis would probably be unaffected by sulfanilamide or any of the newer derivatives that have so far been discovered. For these reasons, I do not believe one would be justified in further lowering the patient's normal recuperative powers by the use of sulfanilamide as a prophylactic measure in peritonitis. If one should culture an organism from the peritoneal cavity that is known to be affected by this drug, its use might be effective.

*Question* What is the influence of bichloride solution on infected wounds and on tissue?

DR ALLEN Bichloride of mercury in a sufficiently strong solution to have much bactericidal power within an infected wound will also destroy living cells. A very weak solution may not actually kill growing cells but when used for irrigation it is not any more effective in ridding the wound of infection than normal salt solution. Cells will grow in a bath of Dakin's solution which will, if properly used, keep bacteria at a low ebb, but even this will at the same time retard cell growth. However, infected wounds may do better with such treatment than without it since the bacteria, if left alone, will kill cells, as they grow, more effectively than a correctly titrated Dakin's solution. I am sure that bichloride of mercury solution should be discarded in the treatment of fresh or infected wounds. Also, I feel very strongly that we should banish this solution from our operating rooms. Since it is an irritant to normal tissue, it disturbs me to see surgeons wash their gloves in it and then proceed to handle the intestine and other delicate living tissue.

*Question* What is the best preparation of skin?

DR MASON There are many methods used today for the preparation of the skin of the operative field. They are all in agreement on one point: the skin should be properly cleansed and, if necessary, shaved. The differences have largely to do with the treatment which the skin receives after it has been carefully washed. For

washing there have been recommended dozens of chemical agents, and each is claimed to be superior to the others on the ground that it is less irritant but just as efficient as its rivals. The truth of the matter is that, to a certain extent, they are all irritant, though it must be admitted that certain of them have proved practically harmless so far as skin reaction is concerned. However, no one of these agents is efficient unless the skin has been properly cleansed with soap and water beforehand. If the skin has been washed carefully with soap and water, almost any of the antiseptics commonly used seems efficient. Curiously enough, however, if the skin has been washed carefully with warm, sterile water and soap just before operation, and no antiseptic whatever is applied, there is even a lower incidence of postoperative infection than when an antiseptic is used. It has seemed to me, therefore, that while antiseptics are possibly only slightly harmful, they are certainly of no value, so I have discontinued their use in the preoperative preparation of the skin, in favor of a ten minute washing with soap and water. Needless to say, this washing should be done gently, with large cotton pledgets, frequently changed; it cannot be done perfunctorily, and should receive the same care that the surgeon uses in washing his hands. In the preoperative preparation of such fields as the mouth, where micro-aerophilic and anaerobic organisms are present, the work of Meleney has shown that zinc peroxide used as a mouth wash tends to reduce the incidence of postoperative infection.

*Question* What is the effect of drying of the tissues during an operation?

DR MASON There is no doubt that delicate tissues are often severely damaged by exposure to the air and the heat of the operating lights. How extensive this damage may be we do not know, but it is possible to kill tissues, or to lower their vitality so that they are less resistant to infections. In operations in the abdomen, the surgeon is always very careful to keep the exposed bowel covered with warm, moist sponges, to prevent drying, but this precaution is too often forgotten in the case of other tissues. It is good practice, as far as possible, to keep exposed tissues covered with sponges which have been moistened in normal saline solution. If this is not possible because of the nature of the operation, the wound may be frequently irrigated with salt solution. This serves not only to keep the tissues moist, but to wash out fat cells, blood, and debris, as well as bacteria which have fallen into the wound from the air.



*Question* Do you prefer moist or dry dressings on closed wounds which you expect or hope will heal per primam?

DR MASON The answer depends entirely upon what is meant by a moist dressing. Certainly the hot wet pack should not be used on any wound in which primary healing is anticipated. Such a pack stimulates an exudative reaction, leads to swelling, increases tension on sutures with necrosis of tissue and predisposes to wound complication. It is my practice, however, to lay over the suture line of clean wounds two or three small gauze sponges wrung out almost dry in normal saline solution and then to cover the wound with large amounts of fluffed gauze which are bandaged on snugly. It has seemed to me that such a dressing conforms nicely to the wound and because of its slight amount of moisture absorbs the few drops of serum and blood which ooze out through the suture line.

*Question* What about the prophylactic use of gas bacillus antitoxin?

DR MASON It is difficult to establish the prophylactic value of gas bacillus antitoxin, since it is well known that the infection may develop after the use of the serum. Some statistical studies of the World War seem to indicate that after prophylaxis with antitoxic serum gas gangrene infections were markedly reduced. However, it is the general feeling among surgeons that while the antitoxin is of value and should not be omitted in instances in which contamination is likely, it does not have the prophylactic value of tetanus antitoxin. Elason and his coworkers in Philadelphia have shown that if gas gangrene antitoxin is used and an infection subsequently develops, the process is less severe than in cases in which the antitoxin has been omitted. It must be remembered, however, that the use of antitoxin does not compensate for neglect in proper cleansing of the wound. The wound must be cleansed and carefully freed of all crushed and devitalized tissues,

especially muscle. The antitoxin is an adjunct to careful surgery, but is not a substitute.

*Question* Should the anesthetist be required to wear a mask? the patient? the orderlies?

DR MASON Every person who enters the operating room should wear a mask covering the mouth and nose. Many surgeons still object to covering the nose, but there is no more excuse for leaving the nose uncovered than there is for leaving the mouth uncovered. McInerney's studies of postoperative wound infections have shown definitely that hemolytic streptococci from the upper respiratory passages of persons entering the operating room may gain entrance into the operative wound and cause severe infections. This source of wound contamination can be controlled only by the adequate masking of surgeons, assistants, nurses, orderlies, in fact of everyone who enters the room. While it is not general practice to mask the patient, I think it is advisable unless operation is performed under general anesthesia.

*Question* From the standpoint of prevention of infections, do you prefer dividing the gut with the cautery or the knife?

DR MAES I prefer to use the knife. The contamination resulting from this method is less likely to lead to infection because of leakage or spill of the intestinal contents than the devitalization of the cut ends of the bowel when the cautery is used.

*Question* Do you think the frequency of dressings bears a definite relation to the incidence of infection in surgery?

DR MAES I do. Repeated dressings of a clean wound serve no useful purpose. The disturbance of the wound which is caused by the manipulations and trauma of repeated dressings interferes with healing. Furthermore, bacteria are much more likely to be introduced by this procedure than they are to be killed by the bright colored antiseptics usually painted over the wound.

# LESIONS OF THE TONGUE

## Collective Review

JAMES BARRETT BROWN, M D I A C S, and HEINZ HAFNER, M D,  
St. Louis Missouri

**R**ADICAL operative removal of the tongue for carcinoma is seldom done at the present time but it is interesting to note that a large number of authors recommend dissection of the cervical lymphatics if there is any promise of a local cure with radium or local operation (22 articles of 26 reviewed). Such uniformity of opinion points to the conclusion, at least for the present, that dissection should practically always be done on the side of the involvement and that close watch should be kept on the opposite side so that it can be done there too at the first suspicion of metastasis. (This is not suggested as a critical review but may be of some statistical or reference value to those interested in the work. Recognition is due to Dr George Crile, two of whose articles are referred to here, because of his pioneer efforts in dissection of the neck for carcinoma.)

### CARCINOMA OF THE TONGUE

Roux Berger and Tailhefer (42) of the Cure Foundation of Paris, in a paper entitled, "The Removal of Neck Glands in Bucco-Pharyngeal Cancer," state that the principle is exposure of the retrostyloid space to remove the jugular vein high and easily. They believe that neck dissections should always be done unless there is superficial or deep fixation of the glands. And in the cases involving the tongue neck dissection is still more important and should be done early, and, furthermore, if it could be done routinely early, there would be fewer hopeless cases. The scar and disability are recognized as being bad, but they are of minor importance in the matter of getting rid of a cancer. The authors have removed the digastric muscle 23 times without trouble and have done 12 operations with only 6 deaths, all this before 1917.

Duval (17) from the Institute of Cancer of Paris in an excellent article entitled, "A Point of Technic in the Removal of Neck Glands for Cancer of the Tongue—The Operation from Back to Front," expresses the principle of exposing the

retrostyloid space to get to the jugular bulb and removing all tissue in one block from the back, forward. This technique was used at The Institute of Cancer of the Faculty of Medicine of Paris for one year without a death and under regional block anesthesia.

Ducung Iabrè and Gouzy (15) of Paris, especially in carcinoma of the tongue, expose the retrostyloid space for the jugular ligation by cutting the upper end of the sternomastoid muscle away as well as the digastric and stylohyoid muscles. The importance of dissecting the whole neck in one block is stressed, and the anterior part of the digastric muscle is removed also.

It is the custom of Cooper (11) to treat the primary carcinoma of the tongue first and allow a period of about four weeks to elapse between the treatment of the primary growth and that of the cervical area. The reason for adopting this method, which has given satisfactory results, is based upon the necessity of giving the patient the best possible blood and lymphatic supply to the area treated. This is an all important matter. The disappearance of the tumor is hampered by the removal of the lymphatics and ligation of the blood vessels, and is, of course, the object of the block dissection operation on the neck. Therefore, the treatment of the neck is left until four weeks after the radium treatment of the tongue. The local lesion is treated with radium element needles of 1.33 mgm. and the average total dose is 1,200 mgm. hours.

The patient is instructed to appear for examination once every week for four weeks when the treatment to the cervical lymph glands is planned out. There is no doubt that, in the present state of radium therapy, surgery is to be given preference in treatment of the neck. The question does not arise if the glands are palpable. In such cases surgical removal is the treatment of choice. All enlarged glands are not necessarily malignant, but operation offers the best possible chance of preventing metastases. The debatable point is whether one is justified in doing a block dissection when glands are not palpable. In the author's experience it appears that operation under local

From the Department of Surgery Washington University School of Medicine St. Louis Missouri

anesthesia is the safer method and should be carried out in every case four weeks after radiation of the primary lesion. Any operation short of a complete block dissection has nothing to recommend it. The operation aims at removal of all glands (including the submandibular), deep fascia, the sternomastoid muscle, and the internal jugular vein.

When glands are found on both sides the operation is performed on the second side after the lapse of a fortnight and obviously the internal jugular vein must be removed on the more affected side.

In inoperable cases complete surgical removal is impossible. It is the custom to bury needles and hope for the best. This procedure must often be supplemented by injections of snake venom, various hypnotics and analgesic drugs.

Searby (44) maintains that in the majority of cases of carcinoma of the tongue death is indirectly the result of metastasis to the cervical glands. There is no doubt that x-ray therapy acts unfavorably toward the process of metastasis but there is also much evidence that in many cases surgical excision with careful clean dissection will prevent metastases or if they have already developed will remove them. A cure will depend on the extent of the metastases and the amount of direct extension. The primary growth on the tongue can be cured by excision if the principles of cancer surgery are applicable. However if radical surgery is not feasible and one wishes to avoid mutilating operations it is necessary to fall back on the selective action of radium treatment. It seems that a proper dose of radium is capable of melting away grossly cancers of the tongue even in those advanced cases in which surgical excision would not be possible. Each case however must be treated individually. A hard and fast rule is not possible. The removal of all teeth before any treatment is started is advised as this is the surest way of avoiding later infections.

Schurck (43) on the basis of surgical and radiological literature and of personal experience, gives a survey of present methods of treating oral tumors. Particularly in these tumors a combination of therapeutic measures is applicable. Radiology and surgery share equal importance in this treatment. A close co-operation between these two methods of treatment may be of great value in the improvement of the heretofore unsatisfying results of treatment. Schurck considers the routine biopsy not to be of great danger and the means of some prophylactic measures such as clearing up precancerous formations (leucoplakia and erythroplasia). Under treatment he discusses electrosurgical methods, the application

of radium (surface application, the implantation of needles and distance radiation) and roentgen therapy. It is here distinctly emphasized that the aforementioned type of x-ray therapy is not less effective than electrosurgical treatment. The electrosurgical attack should be the first choice for small well localized tumors. Radium therapy in the form of implantation is limited in its use because of technical difficulties encountered. The large inoperable tumors are treated by x-ray therapy. Small tumors especially those with a favorable prognosis are to be treated surgically as radically as possible. In every case radical gland dissection of the glands should be done preferably after x-ray therapy to the region. Only the few very radiosensitive tumors are primarily treated with x-ray therapy.

Wookey (51) summarizes that in 54 per cent of the cases of carcinoma of the tongue the primary disease was controlled by radiological methods. Sooner or later in most patients there was an invasion of the regionally lymph glands, and it is thought probable that surgical dissection of the glands might wisely be done before any enlargement can be demonstrated because this seems to offer the best hope of control of the disease in the neck. The results of treatment of other intra oral cancers are much more satisfactory than those obtained when the tongue is involved. Most of these primary lesions have disappeared under radium therapy and the results of early and radical dissection are encouraging. Operations for removal of portions of the jaw have proved of great value in the treatment of a good many of these cases and can be done fairly safely.

Donati (14) immediately after biopsy and microscopic diagnosis implants radium in the tumor of the oral cavity or pharynx. After at least thirty days to allow for subsidence of all local and general reaction to radiation the radioresistant lymph nodes in the neck are removed surgically. Two to three weeks later a course of x-ray therapy is given to the site of operation. Thirteen patients with tumors of the tongue, cheek and tonsils were treated in this manner with good early results but too recently to permit opinion as to recurrence. The very radical surgical management of the usually radioresistant lymph nodes of the neck is described in detail with many illustrations. Local anesthesia is used with intravenous dilaudid, scopolamine pre-operative medication. If necessary one may remove the posterior belly of the digastric and the stylohyoid muscles to gain the best access to the jugular bulb region. It is impossible to do this radical operation bilaterally at one sitting because of ligation of the internal

jugular vein and also because of complete removal of the sternomastoid muscle. The results with regard to recurrence will have to show whether this very radical operation is justifiable. In most instances, the lymph nodes behind the sternomastoid muscle are involved, furthermore, the supraclavicular and the submental glands must be removed since their status can be determined only histologically. Contraindications are retropharyngeal, surgically inoperable metastases, and invasion of or adhesions of the metastatic mass to the carotid artery. In addition, in the opinion of the author, one must exclude radium resistant primary lesions of the buccal cavity and pharynx. The relatively metastatic free cancers of the anterior half of the tongue may be exempt from this radical dissection but should remain under careful observation. The method of treatment must be suited to the individual case.

Seemen (47) reports a case of a large carcinoma of the tongue with metastases in the floor of the mouth and in the submental region in a man fifty-seven years of age. The patient had electrocoagulation of the growth four and one half years ago with removal in layers. The lymph glands were excised and since that time there has been no recurrence.

Stanford Cade (5) states Wallace's summary on glands

1 If no glands are palpable surface radiation is employed

2 (a) If glands are palpable but operable if the condition of the patient is good, and there has been a good, local response to treatment of the primary growth they are removed by a block dissection

(b) If removal of glands is not advisable, open or closed needling (radium) is employed

3 If the glands are inoperable they are given primary treatment with deep x rays followed either by surface application of radium or needling

Results of radium treatment for all kinds and stages of cancer in a total of 337 cases 33.5 per cent of the patients were well from seven to ten years

In 225 cases with tongue involvement 33.3 per cent of the patients were well from seven to ten years, 18.7 per cent from five to six years, and 11 per cent for seven years. The author believes that mass radiation with from 2 to 6 gm. of radium is best although the method is still in development and he states that "radiation is a purely local remedy and has no influence on the subsequent development or dissemination of the disease."

Chase (10) states that neck dissections should be done if the case is not too unfavorable locally,

otherwise, x rays should be used. No results are given.

New (36) gives the following results in 162 cases with involvement of the tongue

		Five Year Survival
Nodes negative but dissected	59	29
Nodes negative not dissected	40	19
Nodes positive and dissected	57	8

Hutchison (26) advocates block dissection in operable involvements and as prophylaxis in practically all cases.

Crie (12, 13) has obtained five year cures in 25 per cent of 549 carcinomas of the buccal cavity, in those cases which, after operation or radium treatment of the primary growth, underwent neck dissection.

Kaplan (27) uses radium treatment locally for carcinoma and then neck dissection if the nodes are movable and intact. When complete resection cannot be done, as much as possible is removed and the remaining malignant tissue is irradiated directly with radon or element of 200 mgm hours per c cm. of malignant tissue. No results are given.

Livingston and Lieber (30) recommend both surgery and irradiation in carcinoma of the tongue, but leave the question of metastasis to others and give no results.

Morrow (33) presents a moderate departure from the usual present day report on carcinoma of the tongue, in 98 cases at the New York Post Graduate Hospital.

His article is summarized, as follows

1 All of the cases showed carcinoma microscopically and two thirds of them were advanced. Neither size nor microscopic grading of the cancers proved of much prognostic value among the cases treated surgically, the operative mortality was 26 per cent, but during the last five years it has dropped to 16.7 per cent. The highest mortality was from 40 to 50 per cent and occurred in the cases with tongue and gland operation combined. Twenty per cent of all of the patients treated surgically survived five years or more, 32 per cent of those without node involvement and 11 per cent of those with node involvement revealed five year cures. The best results were obtained when the two-stage operation was done, removal of the tongue first and then of the glands. Postoperative radiation was not used as a routine measure. Poor local results were obtained with radium and surgery, and only 10 per cent primary healing with radium alone. Five year cures should be obtained in 30 per cent of the cases without node involvement, in cases with node involvement

they will probably amount to less than 10 per cent. Successful treatment depends on keeping ahead of the disease and this should best be done by routine neck dissection whether the glands are palpable or not.

Eggers (19) is one of the most enthusiastic authors in favor of neck dissection and he states that even in carcinoma of the tonsil surgery has a definite place in the early case and as soon as the area is clean postoperatively a radical neck dissection should be done on the side involved and then one on the opposite side if necessary. (No results are given.)

Berven ( ) in Stockholm has used telerradium treatment in 457 oral cancers with 25 per cent five year cures. Telerradium is given first then surgery or interstitial irradiation of the residual areas and neck dissections are resorted to if the nodes do not disappear.

Forsell ( ) in Stockholm reports 115 cancers of the buccal cavity 15 per cent of which were inoperable but gave 15 per cent five year cures with radium alone. In operable carcinoma of the tongue without gland involvement radium treatment gave five year cures in 55 per cent operation in the same condition in 41 per cent. Gland metastases if inoperable are treated by irradiation alone preferably telerradium. If no glands are palpable operation is not done but the telerradium treatment is used however Forsell had no patients with cancer of the mouth with gland metastases who became well with radiation treatment alone. With combined surgery and irradiation 7 of 10 of his patients remained alive for three years and 2 of 5 for five years.

Trotter (48) reports pharyngeal growths cured by pharyngotomy, excision and neck dissection in some instances. He states that radium treatment might also be used but he reports operative results because he knows most about them. An interesting explanation is given of late recurrences depending on loss of active immunity to parts of carcinoma left behind after from five to seven years.

Moure (34) gives the following late results of surgical treatment of carcinoma of the tongue of 57 patients operated on 23 survived from two to six years.

Fraser (23) operated on 68 cases of oral carcinoma without gland involvement 23 per cent of which were reported cured after two years of those with gland involvement 38 per cent were reported cured after two years.

Pfahler and Vastine (37) treated 306 unselected carcinomas of the mouth (not including lips) with radiation with cures in 9 per cent and with their

present technique are obtaining 30 per cent. The authors think from 50 to 75 per cent of the patients should get well if treated properly by irradiation.

Blair Brown and Byars (45, 6, 7) have made neck dissections a routine procedure in carcinoma of the tongue and although it would be best to be sure of primary healing from the treatment of the local disease there have been enough inoperable extensions into the neck during a waiting period to indicate that the gland removals should be done soon after if not right at the time of the radium treatment. Both Butlin and Whitehead practiced preliminary gland removal before operating on the tongue but this urgency has not been found necessary.

Stewart (47) of Memorial Hospital New York City advocates narrowing down indications for neck dissection and relies mainly on the interstitial treatment method of Janeway and Quick. He states further that nearly all patients come in for treatment with glands uninvolved or hopelessly involved.

Duffy (16) and Quick (40) present practically the same ideas as outlined under Stewart.

Holmes (25) in 14 statistical tables of the results of treatment of carcinoma of the tongue, presents the reports of 8 large hospitals in the 6 largest provinces of Australia. These hospitals have for a number of years had a uniform system of recording cancer cases and have carefully followed up the cases after discharge of the patients. This system of reporting cancer cases and following them up had its origin in 1929 after the government had distributed its radium. The statistics of the results in treatment of cancer are inclusive of the years from 1929 to 1933. The cases are divided on the basis of the anatomical site of origin and the extent of the disease into the following groups:

1. Cancer which is limited to the tongue and shows no clinical evidence of involvement of the regional nodes.
  2. Cancer in which the tongue and floor of the mouth are involved without clinical involvement of the lymph nodes.
  3. Cases in which there is secondary involvement of the regional nodes clinically from a cancer of the tongue.
  4. Cases in which the cancer of the tongue or floor of the mouth has invaded adjacent bone.
- The number of patients falling into Groups 1 and 2 that were treated by surgery alone is relatively small yet the results do not appear as favorable as in those treated by a combination of surgery and irradiation or those treated by irradiation

alone. Of 112 patients in Groups 1 and 2 treated by the various methods 78 per cent were living from three to six years later of 163 patients in Groups 3 and 4 only 7 per cent were living. Twenty five per cent of those that died had no demonstrable metastases or recurrence. In 40 per cent of these the primary lesion of the tongue was probably healed but the cause of death was secondary cancerous growths. In 65 per cent of the patients who died, therefore, the treatment was of value even though death ensued. Of 146 patients in Groups 3 and 4 who died 61 had had healing of their primary lesion at some time regardless of whether metastases or recurrence had taken place. Even if the treatment increased the life expectancy by only one or two years a good part of the pain and suffering was alleviated by it. In closing the author urges closer co operation between the surgeon and roentgen therapist because in many cases the best results can be offered by combined surgical and roentgen treatment.

#### MUSCLE TUMORS

Morpurgo (32) described 2 cases of myoblastoma of the tongue. The first was a small benign lesion (after classification of Abrikossoff) without inflammation of the tongue. The myoblastic cells were found to lie in the connective tissue of the muscle layer and extended into the mucosa up to the epithelial border. The muscle bundles were infiltrated by tumor cells. These cells pushed into the layers of the internal perimysium and produced atrophy and absorption of the striated muscle fibers. In the interstitial tissue about the vessels and nerves the myoblasts formed thick layers of concentrically or spirally arranged bundles. The individual myoblasts were most often of short, cylindrical or plump spiral forms with an occasional oval or round cell.

Cappell and Montgomery (9), in reporting 6 tumors of striated muscle discussed the classifications. They proposed two groups, rhabdomyoma and myoblastoma. The former are defined as tumors in which a proportion of cells shows unequivocal transverse and longitudinal striations the latter as tumors in which the cells resemble muscle cells but are devoid of transverse striations. In this group there were 2 rhabdomyomas of the soft palate and 1 myoblastoma of the tongue.

They believe the tongue is one of the most common sites for tumors arising from muscle cells, and emphasize the importance prognostically of differentiation of rhabdomyomas from myoblastomas. The former growing from a mucous surface, tend to assume a tubulated polypoid form with club

bing of the ends of the processes, and the whole mass is suspended from a narrow pedicle. These tumors have a tendency toward local recurrence in spite of extensive surgical removal and are disseminated through lymphatic channels in this process like carcinoma, regional lymph node metastases are, therefore, the risk.

The myoblastomas are generally rounded nodules in the substance of the tongue, only slightly raised above the surface. Local removal may be followed by freedom from recurrence and apparent cure, although examples of malignant nature do occur, as the 1 case described by the authors.

#### CONGENITAL LESIONS OF THE TONGUE

Kolesov (29) reported a case of congenital deformity of the tongue and hard palate. The deformity consisted in a cleft in the hard palate and in the tongue, the latter appearing as a double tongue. In addition there arose fold like swellings of the gums and of the tongue, which at the age of six months, caused difficulty in breathing and had to be removed.

Proskauer (39) reported a case of congenital cavernous hemangioma of the tongue in a girl two and one half years old. On the basis of this case and previously published observations, the author concludes the importance in treating congenital tumors which may occur in any part of the body. Morphologically benign these growths may through their location and growth, become very unpleasant to the individual. This is true especially of hemangiomas of the tongue which are usually small at birth but grow rapidly at intervals. Early treatment is urgent, whether in the form of surgery, chemical means, or some physical agent. Total extirpation is the best but not always feasible choice of removal. Therefore, eradication is tried by ligature, freezing with carbon dioxide alcohol injection, cauterization, electric needling, and radium irradiation. Often results are obtained only after using various methods at the same time or in rapid succession.

Kandersley (28) reported a large arteriovenous aneurysm, involving the right side of tongue the floor of the mouth, and the submaxillary area, present since birth. Division of the lingual, facial, and the superior thyroid arteries gave abolition of the thrill which had been present, but, within a few days, the thrill reappeared and the tumor was no smaller in size. A very large sinus ruptured at re operation and to control hemorrhage the common carotid was exposed lower in the neck and a tape passed around it. The common carotid was controlled by this means and the pack withdrawn, and no appreciable diminution in the flow of

blood was noticed therefore, the tape was removed and the hemorrhage controlled by a gauze pack. It was presumed therefore, that some large anastomosis existed with the vessels of the opposite side.

Federspiel (21) reports cases of macroglossia producing abnormalities of occlusion and respiration and recommends reduction of the size of the tongue by marginal excision around the entire edge rather than V excision which may be applied to either lymphatic or muscular hypertrophies. He cautions that occasionally a seeming macroglossia may be due to a dermoid tumor under the tongue.

#### CHONDROMA OF THE TONGUE

Pless (38) states that chondromas are common but rarely appear on the tongue. Only 8 cases have been reported at the present time 1 chondroma occurring at the tip of the tongue this was described by the author with 3 illustrations. There was a walnut sized pedunculated osteochondroma present on the tip of the tongue which was excised in 1914. The origin of this growth was probably attributable to an injury in the form of a tongue bite sustained in 1918.

#### LIPOMA OF THE TONGUE

Duvour Pollet and Herrenschnmidt (18) reported a case of bilateral and symmetrical lipoma of the tongue and reviewed the literature.

Smith (46) states that lipoma of the tongue is very rare and reports the successful surgical removal of a huge growth in a woman of fifty six years.

#### TUBERCULOSIS OF THE TONGUE

From a clinical point of view Binstok (3) divides cases of tuberculosis of the tongue into three groups. The first includes patients with a positive sputum in which the tuberculous process is often localized near the tip of the tongue or at the sides where carious teeth have caused slight abrasions. The ulceration is superficial spread is by continuity and the progress of the lesions is relatively slow. When associated with a chronic type of phthisis this form of tuberculosis of the tongue is very amenable to treatment by deep cauterization or local excision of the ulcers. When the ulceration is deep with involvement of the lymphatic glands no surgical treatment should be attempted. In these latter cases the best method of treatment is with x rays. The second group consists of cases associated with a general dissemination of the tuberculous infection. The lesions begin deep in the substance of the tongue the infection

being deposited there by one of the numerous arteries the onset is usually sudden. The tongue becomes swollen but there is no ulceration for a long time mastication and swallowing become extremely painful. Surgical treatment is contraindicated and only x rays and analgesics may be used. If the general resistance is poor such lesions go on to deep ulceration. If the resistance is good a tuberculoma of the tongue forms without ulceration. The third group includes ulcerations near the lingual tonsil which spread by means of the lymphatics. Such lesions occur in phthisical patients who have undergone operations in the mouth and pharynx such as tonsillectomy or partial excision of the glottis. The few cases reported in the literature have been treated by applications of carbon-dioxide snow and section of the glossopharyngeal and superior laryngeal nerves to relieve pain. Statistics show that cases of tuberculosis of the tongue form approximately 50 per cent of all the cases of tuberculosis of the mouth cavity.

Martin (31) reports the case of a patient with a lesion that he has called primary tuberculosis of the tongue because in a thorough laboratory and clinical study of the patient no evidence of tuberculosis was found elsewhere.

It is of the utmost importance to have a dark field examination made of all long standing ulcers of the tongue to rule out syphilis.

Biopsy should be done in all cases of ulcers or lesions of the tongue of any appreciable duration or size.

If the lesion is tuberculous a cure can be obtained by excision.

Munro (35) demonstrated 5 specimens illustrative of the varied manifestations of tuberculous disease of the tongue.

He referred to the comparative infrequency of the condition but pointed out that it was not unknown for a patient to seek advice on account of a painful ulcer of the tongue while old standing pulmonary tuberculosis was overlooked.

In his experience he has never seen a primary case of tuberculous disease of the tongue. All of his patients showed lesions occurring almost as terminal phenomena. No treatment was given.

#### SYPHILIS OF THE TONGUE

Ramond (41) reports a case of multiple ulceration of the dorsum of the tongue in a patient with a positive Wassermann reaction pathological fractures and Charcot's joint which was cured with adequate antiluetic treatment.

Tsuzuki (50) found that about 70 per cent of ranula cases are syphilitic for example 23 of 32 cases were proved to be syphilitic by the Wasser-

mann test Histologically, the syphilitic changes in the cyst wall and the surrounding sublingual glands were seen Inoculation tests in rabbit testes of cyst walls were positive Syphilitic ranula cysts can be cured easily by simple drainage of the cysts and the administration of antisyphilitic treatment

## INFECTIOUS PROCESSES

With regard to infectious processes of the tongue, Amit (45) reported 15 acute inflammations There were 3 cases in his series of abscesses at the base of the tongue treated by incision and 7 of diffuse inflammation which subsided He distinguishes between deep phlegmonous infections which require immediate surgical treatment and peritonsillar inflammations which are treated conservatively

Grigsby and Kaplan (24) conclude from a review of 12 cases that abscess of the tongue requires prompt and adequate incision Because of the precarious condition of the tissues surrounding the air passages on account of local infiltration, each patient must be carefully examined before the type of anesthesia is chosen These authors prefer a posterolateral incision because it allows quicker healing and there is less chance of hemorrhage In the 12 cases reviewed, there were no complications or deaths In previously reported cases 3 deaths were due to (1) aspiration pneumonia following spontaneous rupture of the abscess, (2) acute edema of the glottis, and (3) hemorrhage

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# ABSTRACTS OF CURRENT LITERATURE

## SURGERY OF THE HEAD AND NECK

### EYE

Lane L. A. Occupation in Relation to Ocular Cancer *Am J Ophth* 1939 22 267

This detailed and well classified study brought out the fact that the number of cases of cancer of the eye over a period of from seven to thirty years in many of the clinics shows no increase. The number of cases in each type runs constant. The only rise was in the number of cases of sarcoma immediately following influenza epidemics.

The following facts should be given attention by ophthalmologists when taking cancer of the eye histories. It is exceedingly important to know how long a patient has followed his occupation likewise whether any other occupation was followed previous to the present occupation and if so how long that occupation was pursued. These questions often have an important medicolegal bearing. Instances are found in the literature and in this survey material in which a patient suffering with a cancer had changed his occupation. This change in occupation had for a time led to a decrease in the growth. Such a patient should be classified under the primary occupation and is not entitled to compensation.

The exact nature of the duties of the occupation should be noted. Is the patient working more or less constantly with known cancer irritants? It is urged that every person who takes a cancer history of the eye get a complete and full history of the patient. Details are of importance in solving the cancer problem. Good follow up records are of great importance in cancer work. Eye clinics unfortunately almost without exception have not been in the habit of following up their tumor cases. In the institution for the study and treatment of malignant disease the record are far better and good follow up work has been going on in many of them for more than five years. LESLIE I. McDEVOT, M.D.

Gifford S. R. and Marquardt G. Central Angiospastic Retinopathy *Arch Ophth* 1939 21 211

This type of retinopathy occurs in young or middle aged adults usually men showing no generalized hypertension. It affects the macular region and is characterized by symptoms and changes in the fundus which can best be explained as the result of spastic contraction of the smaller retinal arterioles or capillaries supplying this region.

Temporary closure of the central retinal artery or one of its main branches is well known and a few cases have been seen while the artery was closed and again when it had refilled but a permanent visual field defect usually remained. Young persons with other signs of vascular disease may be affected

In a second group of cases closure of the retinal arteries is seen in association with similar changes elsewhere in the body especially in the extremities. Case have been reported of retinal arterial spasm in patients with Raynaud's disease and Buerger's disease. Marchesani has also seen recurring hemorrhages in the vitreous in patients with Buerger's disease.

The present discussion concerns the picture of central retinopathy resulting from constriction of a number of smaller vessels supplying the macular area. Various names and theories have been used in referring to similar conditions appearing in the literature. These are discussed and their similarity to the cases presented is shown. In some of the reports syphilis and tuberculosis were considered to be contributory or causative factor. In all of the group of cases reported here the Wassermann reaction was negative and none of the patients showed evidence of tuberculosis. In the present series of 8 cases the usual examination supplemented by a careful history with respect to subjective symptoms of coldness and paresthesias of the extremities was taken. Blanching of the hands or feet in cold weather or after washing in cold water is suggestive of peripheral angiospasm. Trophic changes are uncommon in cases of recent angiospasm but there is usually flushing or blanching of the skin with change of position. Temperature changes of the skin occur to a greater degree in angiospastic individuals after nerve block and after smoking. Oculometry affords a direct method for measurement of the filling of peripheral arteries and repeated readings during treatment give a means of measuring its effect. Capillary microscopy of the bed of the toenail or fingernail is a convenient means of studying the peripheral circulation. In persons with angiospastic disease the number of visible capillaries is decreased by from 30 to 40 per cent. The caliber of the capillaries is decreased and the capillaries show the phenomenon of plasma skimming in which segments of the capillary are empty of red cells while closely packed cells are seen proximal to the narrowed portion.

In the cases reported the history and findings left no doubt as to the circulatory origin of the condition observed. Evidence of inflammation was not present. Objective evidence of angiospasm was definite and was corroborated by the improvement noted during antispasmodic treatments. None of the patients showed evidence of syphilis or tuberculosis and when focal infection was present it seemed doubtful if it should be considered as anything but a contributing factor. It is conceivable that a shower of toxic material thrown into the blood stream might

produce angiospasm in this vulnerable region in a person with an especially labile vasomotor system.

These findings confirm the opinion of Horniker regarding the cases reviewed by him, but his term central angiospastic retinitis would be improved by substituting the term retinopathy descriptive of a pathological condition without the implication of an inflammatory origin.

It must be emphasized that ophthalmoscopic findings are minimal in the early stages of the condition and that when overlooked the diagnosis of retinobulbar neuritis is likely to be made. Careful examination of the macular region with the fine beam of the Friedenwald ophthalmoscope with the Gullstrand ophthalmoscope or by means of a red free light will reveal signs of retinal edema.

Treatment includes avoidance of tobacco and exposure to cold and freedom from psychic trauma, worry and excitement. The nitrites are efficient vasodilators but their action is transient and the untoward symptoms sometimes unpleasant. The intravenous administration of typhoid vaccine causes vasodilatation in doses of from 10 to 25 million organisms much fewer than are usually employed to cause fever. Papaverine hydrochloride in doses of  $\frac{1}{4}$  gr (16 mgm) given intravenously is the most potent vasodilator and may be given three or four times a day but it was seldom given oftener than once a day. An insulin free pancreatic extract was used with apparent benefit being given subcutaneously in doses of from 1 to 3 c cm. Twelve weekly injections are given and the course is repeated after an interval of a month. When hyperemotionalism is a factor, the barbiturates may be sufficient to relieve spasm. Metabolic disturbances should be corrected and when the metabolic rate is low, circulatory efficiency is increased with thyroid extract. These measures must be continued for a considerable time.

EDWARD S. PLATT, M.D.

### NOSE AND SINUSES

Shepherd A. E. Spence, M.J. and MacNeal W. J.  
Serum Therapy for Streptococcal Infection of  
the Nose, Throat and Ear and Its Complications  
*Arch Surg* 1939 38 206

A survey was made of 30 patients suffering from severe infection with hemolytic streptococci in the otolaryngological region. Four patients with complicating meningitis and 15 whose blood yielded bacteria on culture were treated with streptococcus serum of three different kinds together with other therapeutic measures including transfusions, sulfanilamide and bacteriophage in certain instances. There were 7 deaths and 23 survivals.

The early use of serum may be expected to be successful almost always but because of the effort and expense involved serum therapy will usually be reserved for the more severe cases. The authors recognize that streptococcus serum will not and probably should not be used for streptococcal infections of moderate severity which may be adequately

controlled by the oral administration of sulfanilamide. When however a really grave situation arises in a case of streptococcal infection the proper use of the serum brings a promise of important aid which should not be neglected.

In the all too frequent streptococcal infections of the nose, throat, ear and mastoid the use of sulfanilamide or of serum or of the two in combination may be expected to control the infection and to obviate the necessity of operative procedures. For example, mastoidectomies for streptococcal infections which formerly constituted about 90 per cent of the mastoid operations will become less frequent when modern chemotherapy and serum therapy for streptococcal infections of the upper part of the respiratory tract and of the middle ear are adequately employed. The success already achieved promises even more for the future development of chemotherapy and specific biotrophy of these infections.

NOAH D. FABRICANT, M.D.

Collins E. G. Osseous Affections of the Maxillary Sinus  
*J Laryngol & Otol* 1939 54 222

The authors report in some detail several interesting cases involving the bony walls of the maxillary sinus. Some of the cases are very rare and are of interest chiefly from the scientific aspect.

JAMES C. BRASWELL, M.D.

### MOUTH

Kazanjian A. H. Secondary Deformities in Cleft Palate Patients  
*Ann Surg* 1939 109 442

Kazanjian discusses the problem of secondary deformities in patients with cleft palate. Since the treatment or neglect of certain aspects of the primary deformity is so often a factor in the development of secondary defects, a brief survey is made of the accepted methods of treating the original deformities. Of prime importance is the improvement of the speech of the child and the treatment of various secondary deformities of the face and the dental mechanism. In patients with cleft palate speech defects are principally due to inability of the soft palate to completely close the nasopharyngeal sphincter so that it may function adequately. Secondary deformities of the nose, the upper lip, the alveolar process and the hard palate are quite common. Defects of the nose and lip no matter how extensive may be repaired surgically with fairly good results but the reconstruction of the underdeveloped maxilla is a difficult problem.

Most surgeons agree that the defect of the lip should be closed within the first month after birth if the baby is healthy enough to be a good operative risk. There are several standard methods of repairing lips but the method that answers the following qualifications should be given preference: (1) it should involve a minimum amount of operative trauma; (2) it should be designed toward bringing the separated parts into their normal anatomical position as much as it is surgically possible; (3)

for the sake of the immediate result it must not unnecessarily sacrifice skin tissue and (4) it must include correct approximation of the nostrils as an important element of the surgical problem.

The two stage or multi stage procedure for cleft palate seems to be gaining in popularity as it is a simple method causes a minimum amount of trauma to the soft tissues and also decreases the percentage of operative failures. In general the patient is rehospitalized about one year after the repair of the lip. In the operation the mucoperiosteal tissue is elevated from the bony palate through the usual lateral incisions close to the gingival margin of the teeth and only the hard palate and alveolar cleft are repaired at this time. At this stage no attempt is made to separate the nasopalatine aponeurosis from the posterior edge of the palate bone. The purpose of this first operation is to close the clefts of the hard palate and the alveolar ridge with minimum operative trauma. A few months later a second operation is performed and the soft palate is closed.

The greatest cause of failure in the cleft palate operation itself is infection which manifests itself usually after the fourth day following operation. This infection originates in the nasal cavity, therefore it is important to operate when nasopharyngeal infections are not prevalent in children.

In patients with cleft palate nasal deformities in general may be grouped under the following types: (1) distortion and flatness of the nostril on the side of the original defect, (2) in addition to the above the entire nose may be bent to one side because of the peculiar development of the nasal bones and the septum, and (3) a broad and flat tip often seen in bilateral cleft lips characterized with short columella.

Resection of the septum is often found to be necessary because of marked deviations. In shaping the entire nose it may be necessary to reduce an overzealous hump of the nose to a straight line or to narrow the tip, or perhaps to shorten the nose. Finally the most important step is the correction of the distortion of the nostril itself which is really a typical cleft palate deformity.

In the treatment of the flat tip in bilateral cleft cases it has been advisable to increase the vertical diameter of the columella and to narrow the tip of the nose. Minor defects of the upper lip in patients with cleft palate irregularity of the lower border and distorted conditions of the vermilion border are readily repaired surgically provided that the underlying support the teeth and the alveolar processes are well developed and normal in outline. In gross deformities with pronounced retraction of the lip the principal cause of deformity lies in the retarded development of the upper jaw and distortion of the teeth. In such cases the author instructs the patient to go to his dentist and have all the teeth requiring care repaired or removed and in some favorable cases refers the patient to an orthodontist.

The author cites 8 illustrative case reports at the conclusion of the article. NOAH D. FABRICANT, M.D.

**Gardham A. J.** The Classification of Buccal Neoplasms in Relation to Treatment and Prognosis. *Lancet* 1930 235 677.

Gardham's object in reviewing his experience with 84 cases of carcinoma of the mouth is an attempt to provide more reliable standards by correlating variations in malignancy with gross pathological characteristics. He omits to a large extent questions of microscopic pathology.

Growths of the lip pursue a benign course purely by virtue of their site of origin. Growths of the cheek resemble those of the lip up to a point but statistics regarding their curability vary widely. The malignancy of these growths depends more on the stage of advancement and less on other pathological characteristics than is the case with other growths of the mouth hence it is safe to apply the standards of carcinoma of the lip to growths of the cheek which have not extended beyond the soft tissues. Growths which are more widespread react quite differently. In the author's series it was found that 4 of 5 lesions remained healed for four years or more whereas no patient with a large growth survived longer than two years.

A less common growth which runs a stereotyped course is carcinoma of the floor of the mouth. This tumor forms a very well defined type which is often not recognized. The lesion starts always in the region of the orifice of the submaxillary duct and spreads widely but superficially in the floor of the mouth. It finally attacks the mucous membrane covering the lower alveolus. At the same time it spreads upward on the surface of the hyoglossus toward the dorsum of the tongue where in moderately advanced cases a dimple marks the point to which the tumor has extended. Glandular invasion is nearly always late. As regards both its local reaction to treatment and its metastasizing power this growth is very benign.

The anterior part of the tongue does not impose any particular course on the tumors which arise in it, in the posterior third both squamous cell carcinoma and lymphoepithelioma occur and it is by the manner in which the tumors spread rather than by their site of origin that the most reliable indications are to be obtained. The only other type of growth which runs a course which is decided purely by its site of origin is carcinoma of the lower alveolus. This tumor shows no tendency to spread superficially and the external signs are limited for many months to a narrow fissured ulcer on the surface of the alveolus. The spread of the tumor is entirely into the bone of the lower jaw which causes considerable destruction.

Valuable information regarding malignancy may be gained by observing the manner in which a tumor spreads. Thus ulcerated tumors of the anterior part of the tongue which have not interfered with free protrusion have generally proved to be of low malignancy. Mobile tumors of the tongue which are not

ulcerated are commonly characterized by wide submucous spread. This type shows a ready response to irradiation in the primary growth and the immediate metastases and has a strong tendency toward the formation of remote metastases within five years of its onset.

The author found that surgical treatment of glands classed as doubtfully operable on account of their extent has produced immunity from recurrence for more than four years in 2 cases whereas attempts at radical excision of easily operable glands which have become involved unduly early have proved uniformly disastrous.

In a few cases prompt realization of the high malignancy of an apparently localized growth made curative radical treatment a possibility. Evidence of very high malignancy should be regarded in other cases as an indication for restricting the scope of treatment so as to aim deliberately at palliation. Irradiation in doses which do not cause immediate damage to normal soft tissues may be freely used in the treatment of all growths of high malignancy for late effects seldom come into the picture. In growths of low malignancy when long life can be expected the need for caution is greater than is commonly supposed.

The damage caused to normal tissue by irradiation is difficult to assess but evidence is rapidly accumulating that it is largely a question of liability to subsequent necrosis and of increased susceptibility to independent malignant growths. The decision between operation and irradiation must not be made purely on the grounds of radiosensitivity.

The author classifies most of the growths he describes into one of three classes according to their malignancy and their accessibility. Class A consists of neoplasms which are accessible and do not show any of the characteristics of high malignancy. It includes most carcinomas of the lip and most small carcinomas of the cheek. In these growths both operation and irradiation give excellent results.

Class B consists of growths which are inaccessible but again show none of the characteristics of high malignancy. To this class belong carcinoma of the floor of the mouth, carcinoma of the epiglottic region and a proportion of the pharyngeal and antral growths. These are curable by irradiation unless they actually invade bone.

Class C includes growths which exhibit the signs of high malignancy. Operations designed for treatment of these cases must necessarily be extensive and mutilating but are seldom justifiable.

NOAH D. FABRICANT, M.D.

### PHARYNX

Houser I. J. and Brownell D. H. Malignant Neoplasms of the Nasopharynx. *J. Clin. Oncol.* 1938 1:11 2467

The authors state that malignant neoplasms of the nasopharynx often manifest themselves by symptoms which are extranasal in nature.

Cervical swellings, changes in the tympanic membrane, unilateral deafness or a stuffy sensation in one ear, pain in the head or throat, diplopia or rectus lateralis paralysis or unilateral paralysis of any cranial nerves call for careful examination of the nasopharynx.

All malignant neoplasms arising from the lining epithelium of the nasopharynx appear to be medullary squamous cell carcinomas. Lymphoepithelioma and transitional cell carcinoma are believed to be highly undifferentiated forms of squamous cell carcinoma.

Irradiation is at present the only form of treatment. In spite of the poor results, chances of arresting or destroying the neoplasm would be greater if earlier diagnoses were made.

The nasopharynx should be given careful routine inspection by the otolaryngologist.

JAMES C. BRASWELL, M.D.

### NECK

Blewett J. Laryngocele. *Brit. J. Radiol.* 1939 12: 163

A laryngocele can be defined as an air-containing cyst which arises from and communicates with the cavity of the larynx; the cyst may remain entirely within the larynx or herniate through the laryngeal walls into the soft tissues of the neck. The disease was first described one hundred years ago by a surgeon of Napoleon's army of occupation in Egypt.

Arising from the anterior end of the sinus of the larynx is a small diverticulum called the sacculus or appendix of the laryngeal ventricle. If the sacculus becomes distended with air there is little anatomical hindrance to its presentation into the anterior triangle of the neck around the posterior border of the infrahyoid muscles. In most cases cited in the literature a factor which would cause distention of the sacculus by an abnormal increase in the intra-

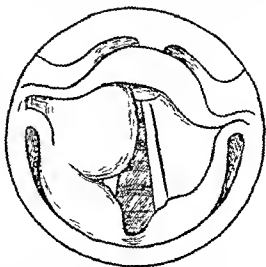


Fig. 1. Appearance of the larynx at the height of the obstructive attack.

laryngeal air pressure has been sought and found. Thus the development of a laryngocele has followed coughing in pertussis and croup straining during childbirth extreme muscular effort vomiting politzerization of the middle ear tuberculous perforation of the larynx and glass blowing.

From the foregoing it would seem that the appearance of laryngocele depends on these conditions that an abnormally developed sacculus become distended by increased air pressure into the larynx that by this pressure it may be protruded beyond the confines of the larynx and that edema of the mouth of the sacculus may be responsible for its maintenance or further enlargement. Types of laryngocele are described according to the position in which the sac develops. When contained entirely within the limits of the larynx it is termed an internal laryngocele but when extension occurs beyond the larynx as well it becomes an external laryngocele.

Laryngocele is seen within the larynx as a cystic swelling arising at the anterior end of a false cord at times merely widening the false cord and causing a funnel shaped gaping of the ventricle at times forming a large globular swelling which may fill the

whole of one side of the ventricle and extend across to hide the other cord. In some cases the cyst only enlarges on forced phonation but in others it remains as a tense tumor obstructing respiration.

Externally a tumor may be present lying mainly anterior to the sternomastoid muscle and varying in size from a barely palpable nodule to a swelling reaching down as far as the clavicle or into the submaxillary region or even displacing the base of the tongue. The character of the tumor may vary like the internal cyst from permanent and almost stony hardness to a fluctuant and reducible hernia like swelling. The patient may be able to distend the tumor voluntarily by forced expiration.

Laryngocele may first appear at any age. Symptoms vary according to the size of the internal cyst. Alteration of voice is common it may be only the presence of a peculiar timbre or an excessive depth of voice hoarseness or weakening almost to aphonia. Difficulty of respiration may be marked and death may occur from respiratory obstruction. Pain is not a prominent symptom. Radiographic examination can be used in the diagnosis of laryngocele.

NOAH D. FABRICANT, M.D.

# SURGERY OF THE NERVOUS SYSTEM

## BRAIN AND ITS COVERINGS CRANIAL NERVES

Alpers B J Abscess of the Brain Relation of the Histological to the Clinical Features *Arch Otolaryngol* 1939 29 199

This report attempts to elucidate the relationship of the time element the type of bacteria and the resistance of a patient with a brain abscess to the matter of properly timed surgical intervention Alpers has studied 26 cases histologically and has presented the views of many contemporary authors on the subject of the histological characteristics of brain abscess

The author believes that an abscess of the brain consists of 4 layers (1) the necrotic zone or abscess cavity with a variety of tissue and leucocytic debris (2) the reactive zone consisting of a layer of loose connective tissue in which lie many fibrin vessels glitter cells polymorphonuclear leucocytes and other types of cells (3) the fibrous zone composed of a dense fibrous tissue with but few vessels in it and (4) the encephalitic zone where there are found swollen ganglion and glial cell bodies a perivascular cell reaction and a meningeal infiltration

The time or rate of capsule formation depends upon the nature of the invading organism to some extent it depends upon the resistance of the host It is very difficult in most cases to judge when a capsule may have formed and the optimum time for capsule formation is variable within wide limits most often perhaps three or four weeks In general the older the abscess the greater the likelihood of encapsulation but as an abscess grows older the capsule need not necessarily grow heavier Traumatic abscesses show the best capsule formation Alpers found that the staphylococci far outnumbered the streptococci and it seems agreed that the more virulent the organism and the more fulminating the original source of infection the less likely it is that one may accurately judge the time of capsule formation Anaerobic bacteria do not favor the formation of a capsule while aerobic bacteria especially the cocci favor capsulation

The capsule of an abscess is composed entirely of elements of connective tissue and the participation of neuroglia in the formation of the capsule is either insignificant or totally lacking This fibrous capsule takes origin from the many fine blood vessels lymphocytes and in cases of trauma from the dura and pia mater

In summary the author finds that it is always safe to postpone operation as long as it seems clinically possible to make more sure that encapsulation has taken place Meanwhile he advises that the sinuses ear mastoid or any other source of infection be looked after He recognizes the fact however, that the surgeon's hand may be forced by the

extreme state of the patient and operation may be imperative when actually a localized encephalitis rather than a walled off abscess is expected to be present Such cases have been known to have successful termination The so called sterile abscess of the brain is practically a nonentity

JOHN MARTIN MD

Davolio Marani B A Contribution to the Recognition of Metastatic Cerebral Carcinoma (Contributo alla conoscenza della carcinosi cerebrale metastatica) *Riforma med* 1939 55 43

Marani has attempted to show what may be the typical course of events in a patient with a pulmonary lesion primary or secondary of a suspected but unproved malignant nature He presents a long and detailed history of a patient running the usual gamut of symptoms fever pleural effusion emaciation development of cerebral symptoms and eventual death due apparently to the cerebral involvement His patient demonstrated no motor or sensory losses There was a high grade bilateral papilledema Roentgenograms of the skull gave no significant clues Progressive blindness was relieved temporarily by lumbar punctures There was moderate rigidity of the neck

At autopsy an advanced carcinoma of the lung was found In keeping with the lack of localizing cerebral symptoms serial sections of the brain were necessary to reveal the widely scattered multiple small and microscopic sized metastatic nodules There were no large masses Though meningeal symptoms were few there was a marked chronic metastatic hyperplastic reaction of all the intracranial meninges

The article contains a good bibliography and a brief review of the pertinent literature over the past few years

JOHN MARTIN MD

## SYMPATHETIC NERVES

Leger L Denervation of the Carotid Sinus (L'énervation du sinus carotidien) *J de chir* 1939 53 176

Lauwers reported in 1931 an interruption of fibers connecting the carotid sinus with the neuraxis in 17 patients suffering from epilepsy The technique of the excision of the carotid body has been confused with that of the denervation of the carotid sinus The intraparietal terminal branches of the nerve of the carotid sinus respond to mechanical stimuli but their sensitiveness to a chemical irritation depends on the carotid glomus which plays the rôle of a receptor In early stages of the surgery of this region great attention was paid to the preservation of the integrity of Hering's nerve but recent investigations proved the harmlessness of the denervation of the sinus even if the operation is performed on both sides In 1933 Lauwers modified his technique and

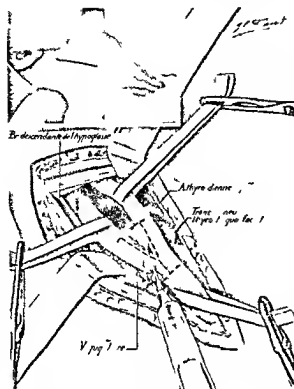


FIG. 1 The carotid crutch is exposed and ligatures placed around the blood vessel. Infiltration of the intercarotid space

began to combine the enucleation of the carotid body with the section of its nerve after preliminary ligation of the external carotid artery below the superior thyroid artery.

In order to interrupt the depressor reflex the author prefers a sectioning of the terminal branches of the nerves in the carotid angle to the cutting of the Hering's carotid nerve at a distance above or below the anastomotic loop described by Cordier because frequent variations of the course of the nerve fibers can make the results of the last mentioned procedure illusory.

The operation is performed with the patient in a semi-sitting position with a pillow under his shoulders. In view of the reflexes originating in the carotid sinus the choice of the anesthetic is a matter of grave concern. While chloroform should not be used because it intensifies the cardio-inhibiting reflexes, ether may be employed because it diminishes these reflexes; morphine intensifies them and therefore should be combined with atropine. Usually the author prefers the local anesthesia. No matter which type of narcosis is used, the pericarotid adventitia and the tissues in the crutch between the carotid arteries should be infiltrated with a novocaine solution without an addition of adrenalin because this precaution prevents syncope. Further

more the infiltration of the pericarotid sheath facilitates the ablation of the peripheral cover of the artery.

The incision is made along the anterior border of the sternocleidomastoid muscle. The dissection of the carotid body and the adventitia of the crutch is carried from the front all around the blood vessels. The accompanying illustrations explain the technique. A bilateral intervention in one stage is possible but the author prefers to perform the sympathectomy first on one side and later on the other. The hemorrhage which follows the section of the artery of the glomus is the best proof that the carotid body has been removed, but the author prefers to ligate the artery before the removal of the carotid sinus. If a compression of the involved region with a finger still produces changes in the blood pressure and the cardiac rhythm, the neurectomy of the carotid sinus is not complete. Slight hypertension following the operation proves its success. On the other hand, local vasoconstriction which follows sympathectomy in other regions of the body is a less dependable sign.

The procedure is harmless provided that the carotid crutch has been infiltrated with novocaine before the section. Advanced age is a contraindication to the procedure in view of the fragility of the cerebral arteries; it is prudent in such cases to preserve the regulating apparatus which the carotid sinus represents. Furthermore, the slight hypertension following the operation is undesirable in old individuals. For the same reason, the author considers hypertension as a contraindication to the operation. The field of usefulness of the procedure embraces epilepsy and the syndrome of hyperirritability of the carotid sinus. Hyperemia following denervation of the carotid sinus counteracts the vasoconstriction which is considered by many authors as responsible for the convulsive crises. Therefore, the denervation may be supplemented by ligation of the external carotid artery. Furthermore, an excitation of the carotid sinus produces generalized convulsions and finally epilepsy has been related to a deficiency in calcium while a denervation of the carotid body is sometimes followed by a reactivation of the parathyroid glands. Such is the theoretical basis for the denervation of the carotid body in epilepsy. Of 80 cases collected from the literature, 15 resulted in complete recovery and 21 presented amelioration of the condition.

The syndrome of hyperirritability of the carotid sinus is most frequently produced by a slight trauma in this region, such as a narrow collar pressure of the razor or a simple hyperextension of the neck. The syndrome consists of an extreme pallor, loss of consciousness with or without convulsions and slowing of the cardiac rate; three types occur.

1. The vagal type in which the vertigo is caused by a sino-aortic or aortic-ventricular block with a resulting acute cerebral anemia. An intravenous injection of atropine stops the attack; adrenalin has the same effect.



Fig 2

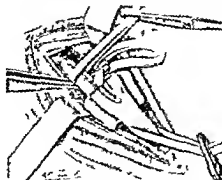


Fig 3

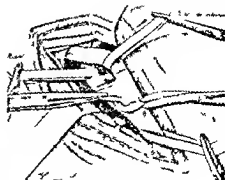


Fig 4

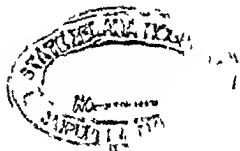
Fig 2 Start of the perisinusoidal sympathectomy Fig 3 Ribbon around the internal carotid is pulled so as to facilitate the posterior dissection Fig 4 Finishing of the posterior dissection

2 The depressor type in which a general vaso dilatation causes a fall of the arterial pressure of extracardiac origin. The manifestations yield to adrenalin but are not influenced by atropine.

3 The cerebral type in which the convulsions and unconsciousness seem to be due to a reflex action on the hypothalamic region. In such cases both atropin and adrenalin are inefficient. The vagal type requires an operation only if the medical treatment

with belladonna or ephedrine proves to be unsuccessful. The depressor type may be treated with adrenalin or ephedrine, and an operation is indicated only in the presence of a complete failure of the conservative therapy. The cerebral type can be successfully treated only by an operation. In 12 of 14 cases collected from the literature the denervation of the carotid sinus produced cure.

JOSEPH H. NARAT M.D.





# SURGERY OF THE THORAX

## CHEST WALL AND BREAST

Andrews J R. The Technique of X Ray Treatment of Operable Cancer of the Breast Based Upon an Analysis of Keynes Radium Technique *Radiology* 1939 32 294

It has been shown by Keynes that survival rates equivalent to those obtainable by radical surgical methods can be obtained by radiological methods in the treatment of primary operable cancer of the breast. This applies however only to interstitial radiation and not to external radiation techniques.

There are at present no criteria based upon statistical survival data upon which to base a concept of adequate dosage in the external irradiation treatment of operable carcinoma of the breast. Keynes' data based upon the interstitial irradiation of breast cancer provide such a criterion on the assumption that a direct comparison in terms of the roentgen can be made. An analysis of Keynes' technique for the irradiation of the breast and axilla in terms of the roentgen was made by the author. The minimum dose in the breast was found to be 3 000 roentgens and that in the axilla from 1 200 to 3 000 roentgens. The doses of x ray necessary to deliver comparable minimal doses to the breast and axilla were found to be at least 3 000 roentgens through each of two lateral breast ports and about 6 000 roentgens through a single port in the axilla. Such radiation to be comparable should be delivered within twenty days.

A case illustrating this technique is presented. The reaction resulting from such treatment is so severe that the method should be employed in the treatment of operable breast cancer only if there are the strongest contraindications to a radical mastectomy. The technique can however be modified so as to be suitable for any inoperable or recurrent breast cancer problem.

If however radical mastectomy is not possible and x ray radiation is employed as the treatment of choice, no radiation technique should be considered adequate which does not deliver in a short time a minimum dose of 3 000 roentgens to any point in the breast and axilla.

JOSEPH K. NARAY, M.D.

## TRACHEA LUNGS AND PLEURA

Nissen R. A Critical Review of Extrapleural Pneumothorax *Brit Med J* 1939 1 100

This author states that a stand should be taken against the present tendency to extend the indications for the use of extrapleural pneumothorax. The operation is an adventure into the unknown.

Extrapleural pneumothorax is an easy operation for both doctor and patient. This statement must be qualified by pointing out that a variety of complications are possible. The optimistic literature at

present available is based on but brief experience. Having had nine years' experience the author believes that much greater caution should be urged. This was approximately the conclusion which he reached in his first publication in 1931 and after many digressions he has returned to it.

Thoracoplasty, its various modifications and plombage are superior to extrapleural pneumothorax. When it is possible to apply them, extrapleural pneumothorax should not be considered. It should be considered only when pneumothorax fails as a result of widespread adhesions when the extent of these does not allow of plombage or when the general condition or the state of the other lung does not permit of a thoracoplasty. Within these narrow limits, extrapleural pneumothorax is the only possible method of collapse therapy. It may be employed even though one cannot expect much from it and the rare permanent results gain in value when one considers the hopeless fate of the patients for whom this form of therapy is recommended.

There is a doubtful indication for extrapleural pneumothorax in the case of recent cavities with delicate pleural adhesions when a thoracoplasty seems unsuitable on account of the risk of mediastinal flutter and a plombe because of the likelihood of its slipping down. These cases are relatively rare. The author now performs extrapleural pneumothorax in cases of this type only when he can assume a sufficient degree of pleural thickening. Then he replaces it by thoracoplasty (apical thoracoplasty). Extrapleural pneumothorax in such a case plays the part of a preparation for rib resection.

J. DANIEL WILLIAMS, M.D.

Jeanneret R. and Kaser V. Note on the Operability of Apico-mediastinal Adhesions and Their Role in the Failure of Pneumothorax (Note sur l'opérabilité des adhérences apico-médiastinales et sur leur rôle dans l'inefficacité du pneumothorax). *Arch. méd. chir. et l'appar. respir.* 1938 13 264.

Jeanneret and Kaser state that in 55 of 300 cases in which artificial pneumothorax was done at the Mont Blanc Sanatorium there were no adhesions present or the adhesions were sectioned before the pneumothorax was instituted. In 49 of these cases or 81 per cent the results of the pneumothorax were excellent, good or satisfactory; the pneumothorax was unsuccessful in only 6 cases (11 per cent). It is noted that there were only 0 cases entirely free from adhesions, less than 7 per cent, which is a low percentage in comparison with cases reported elsewhere.

In 190 cases there were adhesions to the external thoracic wall; they were either apical or lateral, posterior or anterior and of various types—narrow bands or extensive fusion. In this group the artificial pneumothorax gave satisfactory results in only

85 cases or approximately 45 per cent. In 105 cases (55 per cent) the results were unsatisfactory. Later section of the adhesions in some cases resulted in satisfactory improvement. While in 45 per cent of this group the collapse of the lung obtained was sufficient to render the sputum free from bacilli the ultimate prognosis in these cases does not appear to be favorable and a more extensive use of the pleuroscope would seem to be indicated.

In 55 cases apicomediastinal adhesions were present. The pneumothorax gave satisfactory results in 43 or approximately 78 per cent of these cases and unsatisfactory results in 12 or 22 per cent. Artificial pneumothorax is therefore much more likely to give satisfactory results when apicomediastinal adhesions are present than when there are adhesions to the thoracic wall. The results are not so favorable however as when no adhesions are present or adhesions are sectioned before the pneumothorax is instituted. It seems desirable to section such adhesions a precise localization of these adhesions and their points of attachment with the use of the pleuroscope and a careful technique make it possible to do this successfully in many cases. Membranous or cord like adhesions even when their points of insertion are in the zones considered dangerous can be operated on with the use of specially shaped cauterics. An extensive fusion between the apex and the mediastinum is however imperable. The use of the pleuroscope is necessary to determine whether adhesions or extensive fusion is present and for the exact localization of the adhesions. If the pneumothorax is unsuccessful and the pulmonary cavity persists after several weeks pleuroscopic examination is indicated. If adhesions are found they should be sectioned so as to liberate the lung to the hilum. If a true fusion is found some surgical procedure other than pneumothorax is indicated.

ALICE M. MEYERS

O. Shaughnessy, L. and Mason, G. Thoracotomy: A Conservative and Selective Operation for Certain Cases of Pulmonary Tuberculosis. *Brit. M. J.* 1939 1: 97.

This article is concerned with that type of tuberculosis in which the disease usually fibrocavernous has involved mainly the middle or lower zone of one lung in which it has been impossible to obtain an adequate collapse by artificial pneumothorax and in which healing has not followed diaphragmatic paralysis. For this type of case the alternative to the operation to be described was a total thoracoplasty with the consequent functional sacrifice of an unduly large area of healthy lung tissue. This was considered an operation of undesirable severity in view of the general condition of the patients.

Healing was started by carefully designed selective resections of relatively small portions of the ribs in the vicinity of the lesions that is just where relaxation of scar tissue in the underlying lung was required. Thoracotomy was the term applied to the procedure under discussion as it consists essentially

of making the chest wall more yielding in some desired situation and so permits retraction of any scar tissue in the underlying lung.

The portions of ribs which it is usually necessary to remove in this operation are easily accessible through direction incisions and tissue trauma is reduced to a minimum as little retraction is necessary. Consequently the operation is one which can be employed for patients in relatively poor physical condition. It is a comparatively easy operation to carry out under local anesthesia should this be desirable. Comparative freedom from marked post-operative disturbances characterizes the cases in this series. If there is clinical and radiological evidence that the operation has favorably influenced the lesion but has not healed it by the time the ribs have regenerated the operation may be repeated.

The author cites 8 cases in great detail to support his contention. J. DANIEL WILLEMS, M.D.

Myers, D. W. and Blades, B. The Clinical and Roentgenological Features of Pulmonary Abscess Located in the Superior Division of the Lower Lobes. *J. Thoracic Surg.* 1939 8: 311.

Putrid pulmonary abscesses have a predilection for the right lower lobe of the lung. This is not only known to many observers but is also brought out in a review of the cases of abscess of the lung at the Barnes Hospital during a period of three years. Sixty-two cases of non-tuberculous pulmonary abscess were studied. Of these 38 occurred in the lower lobe of the lung, 27 in the right lung and 11 in the left lung. Of all of these 18 occurred in the superior and 20 in the inferior division of the lower lobe.

Although the physical examination is notoriously unreliable definite findings were present in the majority of these cases in which the process was localized in the superior division of the lower lobe. The signs noted were over the posterior aspect of the thorax in the area situated between the spine and the posterior axillary line between the levels of the fifth and ninth ribs. Impairment of the percussion note was the most valuable of all these physical signs. Auscultation revealed frank evidences of consolidation. Rales were almost invariably noted but they were often widely transmitted and were regarded as an unreliable localizing sign.

Bronchoscopic examination provided valuable information and permitted the determination of the source of the purulent secretion.

Roentgen examination in the postero-anterior projection frequently left the false impression that lesions involving the apex of the lower lobe were situated near the hilum of the lung. Roentgenograms in the lateral view cleared this up and showed the true situation of the lesions.

Body section roentgenography with the aid of the laminagraph frequently was successful in revealing a hidden abscess and thus this method constituted an important diagnostic advance. It is of great assistance in determining the relationship of the lesion to the chest wall.

Lipiodol bronchograms have often given additional information which was not provided by roentgenograms. The lesion usually was mapped out by a process of exclusion the area which the contrast medium had not entered representing the site of the abscess.

J DANIEL WILLEMS MD

Tod M C Tumors of the lung Mediastinum and Pleura *Edinburgh M J* 1939 46 95

Two hundred and sixty cases of intrathoracic malignant tumors were collected and studied in relation to (1) the pathological nature of the tumor and (2) radiation therapy. Of the 104 were bronchial carcinomas 140 were tumors arising in lymphoid tissue (Hodgkin's lymphadenoma and lymphosarcoma) and the others were rare mediastinal and pleural tumors such as sarcoma endothelioma and neurocytoma.

The author believes that all primary carcinomas of the lung are of bronchogenic origin and that they apparently arise from small stem cells which lie adjacent to the basement membrane. Carcinomas of the lung are classified as follows: (a) carcinoma with squamous character (b) carcinoma with glandular character (c) undifferentiated carcinoma and (d) mixed types.

In the series of 104 cases 25 per cent of the tumors were squamous 20 per cent were glandular and 55 per cent were undifferentiated. As to the pathology of mediastinal tumors Hodgkin's lymphadenoma is regarded as a true neoplasm and this tumor together with the lymphosarcomas is thought to originate from the primitive mesenchymal cells found in lymphoid tissue. Two primary tumors of the thymus are presented and discussed as are teratomas of the mediastinum and tumors of neurogenic origin arising in the mediastinum. A single case of endothelioma of the pleura is recorded. The author believes that endotheliomas of the pleura exist in spite of certain quoted opinions to the contrary.

External irradiation with x rays is as a rule the only treatment which can be considered for this group of tumors. The conception of treatment is based on three factors viz the radiosensitivity the minimum lethal dose and the time factor. It is suggested that the minimum lethal dose is that dose which will lead to the destruction of all stem cells in the tumor. The stem cells of the lymphoid tumors are considered to be more radiosensitive than those of epithelial tumors hence a dose of not less than 6000 roentgens in six weeks should be used in bronchial cancer while a minimum dose of from 2500 to 4000 roentgens in five or six weeks should be used for primary neoplasms of the lymph nodes. For rare malignant tumors the author advises a dose of 6000 roentgens in six weeks.

The prognosis under x ray therapy is unsatisfactory. One patient with bronchial cancer was alive and symptom free one year following treatment the others died in from twelve to eighteen months after treatment. However palliative treatment with

smaller doses results in the alleviation of distressing symptoms and should be attempted even though distant metastases are present. On the other hand palliative treatments should be discontinued if reactions are encountered which increase the patient's discomfort.

FUTHER H WOLFF MD

D Almolda N Cancer of the Lung Anatomical Clinical Study (Cancer do pulmão Estudo anatômico clínico) *1rq de fofol* 1938 10 221

The statistics published during the period from 1850 to 1924 would indicate that the frequency of cancer of the lung is steadily increasing. The etiological factors may be divided into chemical physical and pathological. To the first group belong tobacco gases used in warfare or industries and gases produced by explosions in motor cylinders. The second group includes foreign bodies in the bronchi and traumas of the chest. Tuberculosis in influenza syphilis pneumoconiosis various avitaminoses and congenital defects comprise the third group. The analysis of each group shows that each factor may be a determining or adjuvant cause in the genesis of the cancer. Generally speaking all factors causing a local irritation play an adjuvant role.

Of the three forms of pulmonary cancer viz diffuse infiltrating bronchiogenic and lobar the last mentioned type is the least malignant. The symptoms of the cancer in this location are not characteristic. In 1 patient axillary and cervical metastases without pulmonary symptoms were found. In several cases the diagnosis has been made by examination of histologically expectorated fragments of the tumor. Lobectomy or pneumonectomy is recommended by the author whenever there is a probability of success. If this is not the case an intratumoral introduction of radon needles according to Tudor Edwards technique is suggested. X ray treatments have only a palliative effect.

The male sex is more frequently affected than the female and the majority of cases occur between the ages of fifty and sixty years. Arsenic nickel and antimony have the greatest carcinogenic effect. Tar vapors and radio active emanations are also dangerous. Bronchoscopy and roentgenograms after injections of a contrast medium are valuable diagnostic aids.

Of 16 patients treated with x rays only 1 recovered and the diagnosis was doubtful in this case. Only an early operation promises a cure.

JOSEPH K NARAT MD

Lumsden C E Pulmonary Carcinoma A Pathological Study of a Series of Cases with Special Reference to the Route of Spread and to the Factors That Determine the Mode of Spread *Glasgow M J* 1939 131 57

In the present series of 43 cases of primary intrathoracic malignant disease 36 were determined as being bronchial carcinomas and 4 were recorded as pleural endotheliomas. Of the remaining 31 mediastinal squamous epithelioma was of unde-

terminated or unspecified origin and the 2 other cases were associated with the esophagus. Only the 36 cases of bronchial carcinoma and the 4 so called endotheliomas of the pleura are considered in the discussion.

Of the bronchial carcinomas 27 occurred in males and 9 in females. The average age incidence of the group was forty seven and six tenths years, the youngest patient in the series being twenty nine while the eldest was sixty eight. In 24 of the 36 cases the neoplasm was in the left lung and in the 12 other cases it was in the right, the upper lobe was involved in 31, the lower in 19, the middle right in 8 and more than one lobe in 17.

In 26 of the 36 cases the neoplasm was described as large in 24, nodular and in 14 diffuse. In 35 cases there was extensive adhesion of the associated parietal and visceral pleura, while in 11 cases there was a considerable amount of fluid in the associated pleural cavity (blood stained in 4) and in 7 there was a similarly large amount in the pleural cavity of the non involved side.

There was a generalized invasion of the mediastinum by neoplastic growth in 18 cases and in 32 the associated tracheobronchial lymph nodes were enlarged and apparently involved by the cancerous process.

Necrosis within the neoplasm had occurred in 24 of the cases. In 4 cases there had occurred large intrabronchial hemorrhage but this was found to have been the immediate cause of death in only 2 patients.

In the majority or 29 of the cases studied a close anatomical relationship of the neoplasm to the wall of the trachea or bronchus was demonstrated, the criterion of this was ulceration of the bronchial wall and obliteration partial or complete of its lumen. The primary focus of the tumor was found to be between 1 and 4 cm. from the bifurcation of the trachea in 20 cases and at the bifurcation of the trachea itself in 6 cases. In 4 cases the appearances warranted the opinion that the tumor had started in one of the main branches of the primary bronchus and in only 1 case was it demonstrated satisfactorily that the growth had developed primarily in relation to a bronchiole. In no case was there any indication that the carcinoma had arisen from more than a single focus.

Metaplasia of the bronchial epithelium was demonstrable microscopically in sections taken from 9 of the cases, the epithelium in question varied from a single layer of basal cells through the cuboidal and simple squamous type to in 1 case true stratified squamous epithelium.

Prominent among the associated pulmonary conditions present in these cases of bronchial carcinoma were suppuration in 24, partial collapse of the lung in 12, bronchiectasis in 12, pulmonary fibrosis in 11, pulmonary edema in 9, extensive cavitation in 8, widespread fibrinous pneumonic changes in 8, emphysema in 4, pyemia in 1 and tuberculosis in 1. No example of infarction occurred.

In 4 of the 36 cases metastases, either regional or distant were absent or were not recorded, but in 31 of the cases definite metastases were found in the regional lymphatic nodes. Metastases to distant structures or organs were described in 17 cases, they were single in 3 and multiple in 14. Macroscopic metastases were recorded as follows:

	No. of Cases
Regional lymphatic nodes	31
Liver	9
Abdominal lymphatic nodes	8
Opposite lung	5
Skeletal system (vertebrae 3 ribs 1)	4
Kidneys	3
Brain (cerebrum 2 cerebellum 1)	3
Pancreas	2
Diaphragm	1
Spleen	1
Adrenal gland (left)	1

In 5 cases there was actual invasion of the posterior parietal pericardium, in 3 there had been pressure on the superior vena cava leading to edema of the upper extremities, the arch or the descending thoracic aorta was completely surrounded by firm growth in 2 cases and in 1 pressure by involved lymphatic glands had caused paralysis of the recurrent laryngeal nerve.

The tumor mass was invariably related to the main bronchus or to one of its branches, it was usually of an annular type, it invariably extended along the wall of the air passage involved, either in a central or a peripheral direction and while it usually extended also radially in relation to the center of the bronchus it did so fairly evenly and the spread in this direction was never so extensive as that longitudinally to the axis of the bronchus.

Stenosis of the bronchial lumen was rarely complete and was usually a late complication when it occurred it was most frequently due to fungation of the tumor tissue which had come from outside of the cartilaginous plates and had penetrated between these into the submucosal tissue. It appears that bronchial carcinoma although arising from bronchial epithelium does not proliferate into the lumen of the bronchus in the initial stages as frequently as might be expected.

Cases seen at autopsy always exhibited two other characteristics: first a marked neoplastic invasion of the fibrous supporting tissue around the structures in the pulmonary hilum with the almost invariable involvement of the hilar lymphatic nodes and second a marked thickening of the peribronchial perivascular interlobular and interlobar fibrous connective tissue. The thickening in the second group of instances was due to neoplastic invasion with or without accompanying fibrosis but occasionally fibrosis alone was present and neoplastic extension was not demonstrated microscopically in this thickened fibrous tissue.

Discrete satellite nodules were sometimes seen in the lung substance peripheral to the main and presumably oldest mass of the tumor but these were

always smaller than the parent mass. In the case of lung carcinoma at least the growth of neoplasm conforms to the general biological experience that the size of a growth is a moderately good indication of its relative age. Perhaps it is the latter assumption that accounts largely for the diagnosis when it is made of pleural endothelioma in which the large mass of the tumor diffusely spread through the pleura contrasts so markedly with the smallness or absence of any tumor tissue in the lung substance away from the pleura. That the histology alone can not determine whether a malignant growth in the pleura is primarily of that structure has been repeatedly emphasized.

Microscopical examination of the fibrous connective tissue in any of the sites mentioned above has rarely failed to demonstrate numerous instances of neoplastic cells growing actively in and along the lymphatic spaces and lymphatic vessels.

There are two main divisions of the lymphatic structures of the lungs: one set in the pleura and the other in the pulmonary tissue. They both drain into the lymph node at the hilum. In the lung parenchyma the lymphatic system consists of lymph vessels in relation to the air passages and the blood vessels; there are no lymphatic vessels beyond the alveolar ducts. The lymph drainage from the alveolar wall into these lymphatic vessels occurs by way of the tissue space. Comparative studies lead to the possibly significant conclusion however that this must be small both in health and in disease. All the lymph vessels of the pulmonary tissue drain toward the hilar nodes and are valveless.

Lymphatic communications between pleural and superficial pulmonary plexuses are relatively few and the communicating vessels that are present are guarded by valves pointing toward the pleura which provide a mechanism whereby lymph can flow from the pulmonary tissue into the pleural lymphatics if the normal flow of lymph in the former toward the hilum is interrupted.

From the hilar lymphatic nodes invasion by the neoplastic cells can occur rapidly into the mediastinum. There is free communication between the lymphatic structures of the mediastinum, the parietes, the retroperitoneal tissues and the deep structures of the neck.

In the type of growth discussed massive necrosis is common and it might well be that through the act of respiration small particles of the tumor become detached from the mass and are inspired into deeper parts of the bronchial tree, there to set up secondary growths. No evidence however has been found that such dissemination occurs.

The neoplastic cells also may grow along the inner walls of the small bronchi and of the alveoli. This can usually be demonstrated in serial sections taken near the periphery of the growth but this is a slow mode of spread and plays only a subsidiary part in the dissemination of the carcinoma.

Regarding the 4 cases of endothelioma of the pleura the criteria upon which the diagnosis had

been made were (1) the apparent localization of the neoplasm to the pleural structures and (2) the histological type of cell present in the tumor.

In 2 of the cases subsequent microscopical examination showed the presence of neoplastic tissue in relation to one of the branches of the bronchi in the lung but in the other 2 no evidence of an intra-pulmonary neoplasm was found.

In every case the cells were of a flattened squamous or cuboidal type. Spread had occurred extensively along lymphatic vessels.

Three possible routes are available for the spread of the tumor in the lung tissue: first by way of the tissue spaces and lymphatic channels; second by way of the blood vessels; and third by way of the epithelial surfaces. In the pleural cavity dissemination may occur by transplantation.

With the very rare exception of round cell sarcomas of the mediastinum arising either in relation to thymic tissue or to lymph nodes, the majority of primary intrathoracic malignant neoplasms are carcinomas originating in a focus related to the lining of the bronchial tree.

The neoplasm grows out along the lines of least resistance. Following the tissue spaces it soon comes into contact with blood and lymph capillaries. The blood capillaries must either resist invasion by the neoplastic cells or else be occluded by the neoplastic process, since evidences of intracapillary growth and embolism are not seen in the histological picture. The lymphatic capillaries however form a frequent route of spread of the neoplasm and as the latter grows more and more lymphatic channels are invaded and the neoplastic cells eventually reach the associated bronchial lymph node where a metastatic focus is formed. The neoplastic cells are carried along as emboli or they permeate by continuous growth along the walls of lymphatic channels; it may be that the latter is the essential manner of lymphatic metastasis.

The relative infrequency of spread by the arteries and venules in contrast to that by the corresponding lymphatic channels may be due to structural differences in the walls: the walls of the former consist of well developed structures whereas those of the latter are little more than a layer, possibly incomplete of endothelial cells. A neoplasm in its growth therefore can erupt into the lumen of a lymphatic channel more easily than into the corresponding blood channel. The flow of blood is relatively rapid also whereas that of the lymph is more of the nature of a percolation. Should a single neoplastic cell reach the lumen of the blood vessel it is likely to be washed away and dealt with by the natural mechanism whereby effete cells in the blood are destroyed. Such movement of the lymph as occurs in the lymphatic vessel not only is slower but is of a to and fro nature, moreover again in contrast to the blood flow when a lymphatic vessel of even moderate size is occluded the lymph drains readily occurs in the opposite direction to that which it formerly took and the fluid is thus carried

away along neighboring channels. Thus even the single cell reaching the lumen of the lymph vessel and blocking it will be more likely to remain there and be thus enabled to reproduce forming a continuous chain of neoplastic cells along the lymphatic lumen or a smaller or larger mass of neoplastic growth.

The evidence of spread of carcinoma by the blood stream is the occurrence of secondary metastatic foci in organs which like the brain have no lymph drainage system communicating with the general lymphatic system of the body. Such generalized spread by the blood stream is common.

What part if any respiratory movement plays in the spreading of pulmonary carcinoma has not been determined but the examination of sections leaves no doubt that spread occurs from one alveolus to another by the continuous growth of neoplastic cells along the wall of these spaces.

Invasion of the respiratory units probably occurs by the eruption of the neoplastic cells from the terminal portion of a lymphatic vessel into the atrium. Having spread along the surface of the alveoli of the respiratory unit the advancing neoplasm reaches the alveolar duct the cells then pass into the lymphatic vessels which are associated with this part of the respiratory apparatus and along which the neoplasm has not yet extended. Thence further extension is by the lymphatic vessels.

SAMUEL KAHN, M.D.

**Sergent E. and Kourilsky R. Pleural Endothelioma, a Radiological and Pleuroscopic Picture (Contribution à l'étude de l'endothéliome pleural: image radiologique et pleuroscopique).**  
*Presse med* 1939 47 257

Pleural endothelioma is not very common. Most cases have been discovered at autopsy following anatomical and histological examination or during life from cytological findings in the pleural puncture fluid. The latter are often difficult of interpretation and the roentgenographic picture of the condition is not well known. For this reason the authors feel justified in reporting a case in which diagnosis was established during life by exploratory pleuroscopy, the roentgen picture showing a series of rounded pseudocystic shadows of peculiar aspect. The patient was a man sixty two years of age who had for twenty years been subject to attacks of paroxysmal cough lasting for about ten minutes and occurring in the morning on awakening or at night. The cause had not been discovered. In October 1931 after a violent attack of cough he mechanically put his hand to his right chest and to his great astonishment felt a tumor at the third rib. The tumor was painless but quite large and of oblong shape. Since this date the patient complained of slight dyspnea. An examining physician suggested that the condition might be syphilitic osteitis and prescribed two series of quinine which had no effect. A roentgen examination made in October 1931 proved negative. In January 1932 a pleural effusion was found

and puncture yielded 350 c cm of serofibrinous fluid. The effusion reformed very rapidly, and three weeks after the first puncture another puncture yielded 2 500 c cm of fluid and led to an attack of acute pulmonary edema. The further punctures were then spaced more carefully at shorter intervals and yielded about 1 500 c cm every ten days. A diagnosis of pleural tumor was then established and deep roentgenotherapy administered, about eight sittings in one month the dosage being unknown. After hospitalization another series of irradiations was administered totalling 3 000 roentgens. This time the fluid did not reform so rapidly and punctures could be made monthly.

Re examination in June 1932 showed that the pleural tumor involved the right sternocostal region and it was believed to be of myelomatous nature. Operation was advised. The endothelial cells in the puncture fluid were of a peculiar type. Many had several nuclei and many were united into plasmodia. Hesitating with regard to operation the patient was given a course of autoserotherapy but without appreciable result. The fluid reformed with progressive speed and in September 1932 punctures had to be made every ten days. There was no fever and the general condition of the patient remained good. A collateral circulation had developed about the tumor which was hard and painful to palpation. During an attack of cough the tumor increased in size and became painful. It could not be reduced by prolonged pressure however. Percussion revealed uniform dullness over the entire right half of the thorax but most marked in the lower half over the tumor. The heart was displaced slightly to the left. Roentgenological examination revealed a diffuse shadow over the entire right hemithorax. A fluid level could be demonstrated about half way from top to bottom. Above it appeared an opacity instead of the expected rarefaction. The fluid was movable when the patient changed position. The liver and spleen and the glands in the supraclavicular and axillary regions were normal. It was clear that the patient was suffering from a neoplastic pleurisy but the origin of the tumor was more problematic.

For a long time an osseous origin was suspected based on previous discussions and the initial diagnosis of osteitis. However this theory had to be rejected because no bone swelling could be demonstrated. As for a mediastinal origin the roentgenological examination with oblique exposure showed that the median rarefaction was definitely above the fluid. Moreover no marked mediastinal compression nervous or bronchial could be noted in spite of the long duration of the disease. There was partial venous compression but this could not be attributed to the systems of the superior vena cava or the brachiocephalic trunk. The swelling was likewise definitely subclavicular superficial and without connection with the mediastinum. These findings thus eliminated the theory of a mediastinal origin. Nor did a pulmonary origin seem probable. The patient had never exhibited parenchymal symptoms

of cancer of the lung. He had no fever, there was no expectoration nor hemoptysis, and there were no signs of pulmonary congestion demonstrable in the roentgenogram.

From the clinical findings alone it was concluded that the origin of this neoplastic pleurisy was exclusively pleural. As the growth was endopleural it was quite natural that the functional symptoms should be limited to an unproductive cough. The peculiar feature in the history of this patient was the attacks of dry cough over a period of from fifteen to twenty years without laryngitis or pharyngitis, so that it seemed plausible to suspect that there had existed a benign subpleural process remaining latent for a long time and becoming suddenly malignant. The unusual number of endothelial cells in the puncture fluid, the nuclear malformations, and the plasmodial aspects of the fluid all suggested an intrapleural process. Although no metastasis developed, the fluid reformed more and more rapidly and necessitated frequent punctures, and the infiltration of the pleural masses became more and more extensive as demonstrated radiologically. The tumor in the right side of the chest became enormous. The patient died in September 1933.

Pleuroscopy showed that all of the rounded pseudocystic shadows in the roentgenogram corresponded to endotheliomatous masses resembling

strawberries with such abundant vascularization that biopsy was dispensed with for fear of hemorrhage. In spite of this rich blood supply the pleural fluid was not bloody and contained only a few erythrocytes. Vital staining of the endothelial cells revealed the unquestionable endotheliomatous nature of the neoplasm. In spite of its endothelial origin and malignancy the tumor was not radio-sensitive.

Sørensen recently reported the finding of 4 such cases in a series of 5680 autopsies. He likewise emphasized the difficulty of clinical diagnosis. Sarcoma and endothelioma of the pleura are not associated with pleural effusion. The presence of effusion should suggest endothelioma in aged subjects. Such effusion is not necessarily hemorrhagic, however. If such effusion is recurrent and without parenchymatous symptoms in spite of considerable duration, a pleural neoplasm rather than a pulmonary tumor is probable. Roentgenologically the presence of rounded pseudocystic shadows with a free posterior mediastinum is suggestive. Multiple hydatid cysts are not accompanied by abundant or recurrent effusion and are always associated with parenchymatous symptoms and a positive Casoni test. Pleuroscopy will reveal the strawberry-like masses on the interior of the pleural surface.

EDITH SCHANZ MOORE

standing of the effects of dehydration and dechlorination which accompanied pyloric and duodenal obstruction or fistula. The efficacy of saline solution in prolonging the lives of dogs with duodenal obstruction served to explain the significant lethal factor in high intestinal obstructions fairly well.

The cause of death in experimental ileal obstruction has defied complete understanding. The administration of saline solution fails to prolong life materially, whereas in obstruction of the pelvic colon in the dog survival continues for a long period of time without the administration of saline solution. It has been the authors' belief that the inability of the patient to empty the lower reaches of the gut by vomiting causes the gut to become distended by ensuing sustained increments of the intraluminal pressure attended in turn by interference with the blood flow and satisfactory oxygenation. By covering of the terminal ileum and anastomosis of the proximal end to the stomach (end to side) it was found possible to keep a dog alive for fifty-six days.

Demonstration of the possibility of relief of certain mechanical obstructions by suction applied to an intubing duodenal tube supports the belief that distention with its associated sequela was the item of chief importance in causing death in ileal obstruction. The agents causing the distention are gas and the digestive juices. McIver and his associates have shown swallowed air to be the principal source of gaseous distention of the stomach after abdominal operations. In this laboratory it has been shown that swallowed air accounts for about 68 per cent of the gas present in instances of simple mechanical obstruction. Having in mind the great absorptive capacity of the small intestine it is quite reasonable to assume that if swallowed air could be excluded from the intestine even in the presence of obstruction the digestive juices could be absorbed and obstruction of the terminal ileum tolerated fairly well.

A method of exclusion of swallowed air from the intestine by cervical esophagostomy was performed in dogs by a two-stage operative procedure. In 11 such dogs the average survival period after the establishment of complete occlusion of the terminal ileum amounted to thirty-six days. One of the animals survived for a period of fifty-seven days. The authors found that dog in which a long closed loop of esophagus, stomach and entire small intestine was made absorbed the digestive juices when swallowed air was excluded. At autopsy the gut was usually found collapsed. The exclusion of swallowed air obviates the distention factor. It also relieves the sequela of decreased vascularity and increased permeability which attend sustained increases of intraluminal pressure.

The experiments indicate that complete occlusion of the terminal ileum may be well tolerated if the gut is not allowed to become distended by swallowed air. In effect the experiments indicate that the mechanical factor of distention and not a toxic factor accounts for the lethal issue in ileal obstructions.

JOHN W. McIVER, M.D.

Barbieri A. The Roentgen image in Ascariasis (L'indagine radiologica nell'ascariasi). *Radiol med.* 1939 26 197.

Barbieri insists on the great value of roentgen diagnosis of ascariasis. In the beginning ascariides were recognized from a negative image by means of the ingestion of opaque substance but later they were also demonstrated without the help of opaque substance or by means of some natural contrast such as that offered by gas present in the intestine or injected for that purpose (Figs 1 and 2). When ascariasis is suspected roentgen examination without the use of opaque substance should never be neglected the exposure being kept as short as possible and the erect as well as the recumbent posture being used. Hydrogaseous levels present in the abdomen may be very helpful in demonstrating the ascariides when part of their body is immersed in the liquid and the other part is free in the gas. Masses of ascariides may be revealed by fine transparent streaks running in a parallel direction or forming a network. This is seen especially in cases of intestinal obstruction by the worms. When the digestive tube of the ascariis is filled with gas a fine transparent line will be found to run through the length of the body of the parasite or will appear as a transparent point in the center of a disc depending on the incidence of the rays.

The easiest way to diagnose ascariasis roentgenologically is by the use of opaque substance administered to the patient who should be fasting since the evening before the examination. The opaque meal consists of water 200 ccm, barium sulfate 150 gm and a little sugar and cocoa. Some spoonfuls of thick solution are given first as for the study of the gastric folds especially if the presence of ascariis in the stomach is suspected then the whole meal is ingested. The upper part of the intestine can be examined within a few minutes and the entire small intestine in about two hours. The ascariides are demonstrated by the presence of filling defects in the lower parts of the intestine especially in the erect posture it may be necessary to have recourse to certain manipulations to separate and compress individual loops in order to show the presence of filling defects. Generally only a short part of the body of the parasite is visible but the manipulations may in this case succeed in demonstrating more of it by distributing better the opaque substance. Excessive presence of opaque substance obliterates the parasite. Repeated observation of the intestine is recommended. The most common a priori encountered is that of a streaky filling defect with parallel well limited borders in the vicinity of which the barium shadow assumes a gradual haziness which increases toward the axis of the body of the worm and gives the impression of roundness of the body. If an extremity of the parasite is visible it shows the characteristic shape. The width of the image varies from 3 to 8 mm generally the length and thickness of the body of the worm can not serve to distinguish a male from a female. The



# SURGERY OF THE ABDOMEN

## GASTRO INTESTINAL TRACT

Forssell G. The Role of the Autonomous Movements of the Gastro Intestinal Mucous Membrane in Digestion. *Am J Roentgenol* 1939 41 145

With the help of serial photographs the author presents the results of his anatomical investigations concerning the variations in the mucous membrane of the gastro intestinal tract.

The folds of the mucous membrane adapt themselves continually to the degree of contraction of the muscle wall but at the same time the mucous membrane relief adapts itself to the consistency and form of the contents of the digestive canal and to the regulation of the forward passage of these contents.

With maximal contraction of the muscle wall and with an empty lumen the mucous membrane fills out the muscle tube and forms an 'initial relief' with an appearance which is specific for each particular segment of the digestive tract. In places where the digestive canal is very distended the mucous membrane adopts a uniform final relief. In the stomach, colon, and rectum, except the sphincters the mucous membrane folds then disappear while in the small intestine transverse folds persist even in the state of marked distention.

A certain contraction of the muscular tube is necessary for the formation of macroscopic folds in the mucous membrane. After such a contraction the mucous membrane by alternately producing a smooth surface or folds of various sizes and forms without altering the diameter of the muscular tube is able to form a working relief the shape of which can vary greatly at the same site.

MANUEL E. LICHTENSTEIN, M.D.

Hesser S. On Relapsing Gastric Hemorrhages and Their Treatment. *Acta med Scand* 1939 98 349

There were 512 admissions to the Linköping Hospital in Sweden for acute massive gastric hemorrhage during the past nine years. This material consisted of 406 patients, 284 of whom had been admitted once for hemorrhage and 122 of whom had had 2 or more hemorrhages necessitating 228 admissions. Thirty per cent of the 406 patients therefore experienced multiple hemorrhages. In these 122 patients the incidence of hemorrhage varied from 2 to 22 times per individual with a total of 370 hemorrhages.

Among the 122 patients there were 7 deaths, 3 of which may be justifiably deducted because they occurred as follows: 1 in a seventy-four year old man with a perforated gastric ulcer in whom death followed the first hemorrhage; the second in a forty-six year old man in whom the hemorrhage was complicated by cirrhosis of the liver and ascites; the third

in a patient who had a complicating glomerulonephritis and acute bronchopneumonia. The remaining deaths were in a seventy-four year old woman with arteriosclerosis, a forty-one year old woman with cystic kidneys, an eighty-four year old man with arteriosclerosis and bilateral bronchopneumonia and a sixty-four year old man who died from peritonitis secondary to surgical leakage. All the deaths occurred in individuals more than forty years of age. In an analysis of the prognosis the uncorrected mortality would therefore be 4 deaths from loss of blood in 122 patients or 3.3 per cent. However, these 122 patients were hospitalized 228 times for hemorrhage; therefore in 228 hemorrhages there were 4 deaths or a mortality of 1.77 per cent.

The author's surgical experience is based upon 30 of these 122 patients. A gastro enterostomy was done 14 times, a Billroth I operation 7 times, a Billroth II twice, a Polya resection plus gastro enterostomy once, division of the fundus and gastro enterostomy twice, invagination of the ulcer 8 times, excision of the ulcer twice, and exploratory laparotomy twice. Surgery exercised apparently little or no effect in the prevention of recurrences of hemorrhage because the 14 patients who had had gastro enterostomies subsequently had 24 hemorrhages. The 7 patients upon whom the Billroth I operation had been performed had 11 postoperative hemorrhages and the 5 patients upon whom the Billroth II operation was performed had 29 hemorrhages. This was contrasted to the 96 patients not operated on or who were subjected to only minor surgery in whom there occurred a total of 306 hemorrhages. Thus on the average in the operated cases there were 2.5 hemorrhages per patient and in the non-operated 3.2. The essayist concludes that it thus appears indubitable that relapse hemorrhages after the different kinds of gastric operations which are here under consideration are not unusual, and that one may venture to say that a gastric operation is by no means an effective prophylactic measure against relapses. To what extent they have been of benefit or whether they have been of any value at all cannot be judged from this material but the conclusion will be that it is wise not to hope too much.

SAMUEL J. JOCELYSON, M.D.

Wangenstein O. H. and Rea C. E. The Distention Factor in Simple Intestinal Obstruction. *Surgery* 1939 5 327

It has become increasingly apparent that the factor of distention plays a significant role in the sequence of events which attends obstruction of the bowel. For many years it was generally believed that absorption of abnormal toxins formed during the course of the obstruction was the important determinant which brought about a lethal issue. The breakdown of this hypothesis began with an under



Filling of the appendix depends upon an extrinsic mechanism, namely, the peristaltic pressure exerted by the cecum. Emptying of the appendix on the contrary is intrinsic in nature, being due to appendicular peristalsis. By roentgenological observations covering a period of seven years the authors were able to determine that an appendix is healthy when it fills within six hours after the beginning of gastric evacuation empties before the cecum does, is uniform in caliber and is dense and homogeneous in contrast. Free mobility and absence of tenderness are not essential points.

Normally there is a balance or complementary correlation of cecal and appendicular peristalsis. In the course of the passage of barium through the colon, cecal peristalsis becomes slower and appendicular peristalsis stronger, thus the contents of the appendix is forced back into the cecum. Therefore when the cecum is empty retention of barium in the appendix must be due to the inability of the appendix itself to expel the barium it contains and not to any extra appendicular interference.

Stasis in the appendix indicates a disorder of intrinsic appendicular activity. In appendicitis whether acute or chronic stasis in the appendix itself is the leading roentgen sign. This stasis is isolated. Barium is retained in the appendix after evacuation of the entire colon or at least of the cecum. Appendicular stasis coexistent with colonic stasis is rare and of no diagnostic significance. Even in those acute stages in which swelling of the mucosa causes scanty and delayed filling stasis is always associated with the other findings.

The authors observe that whenever stasis was found roentgenologically certain histopathological signs of chronic inflammation were demonstrable in the muscularis of the appendix, especially with lymphocytic infiltration and degenerative changes in the ganglion cells of the plexus of Auerbach and Meissner. It is of special importance to note that foci of lymphocytic infiltration were found scattered throughout the muscularis and at times also in the serosa in practically all the cases of acute and subacute appendicitis observed by the authors. The significance of this statement is emphasized by the fact that in the experience of the authors practically all cases of acute appendicitis were cases of acute appendicular obstruction.

Several factors may lead to acute appendicular obstruction because of the following facts: (1) the lumen of the appendix is much narrower than that of the cecum; (2) the musculature of the appendix is proportionally thicker than that of the cecum; (3) the filling of the appendix is dependent upon cecal peristalsis provided the appendix is open and relaxed; (4) the emptying of the appendix depends upon its own mobility and (5) pressure in the cecum may force material into the lumen of the passive appendix, which the latter can expel only with difficulty. Consequently when the wall of the appendix is chronically inflamed, whether with scar formation or without it, the existence in that wall of

the chronic lesion described may lead to interference with its mobility and hence to obstruction. As is well known, necrosis results from obstruction and thus the balance between the tissues and the microorganisms present is upset in favor of the latter, and acute inflammation is induced.

The authors stress the fact that motor disturbance associated with chronic inflammation seems to be an essential factor in the production of acute appendicitis. While it is difficult to prove this statement directly, the correlation between demonstrable motor disturbances and signs of chronic inflammation in the intrinsic neuromuscular system of the appendix is strong presumptive evidence of the correctness of this conclusion.

Inflammatory edema indicative of acute inflammatory swelling of the appendicular mucosa, may be recognized roentgenologically by circumscribed rounded prominences bulging into the lumen of the appendix. These semilunar prominences are from 4 to 8 mm in length, about 2 mm high, sharply defined and smoothly rounded. By their persistence and by their globular outlines these formations are easily distinguishable. *MATTHIAS J. SEIFERT, M.D.*

**Gretze S. Pathological Conditions Following Trauma in the Region of the Appendix So Called Traumatic Appendicitis (Über post-traumatisch auftretende Krankheitszustände in der Appendixgegend—sog. traumatische Appendizitis).**  
*Acta chirurg. Scand.* 1939 83: 11

Interest in a possible relationship between trauma and appendicitis was aroused by a personal experience wherein a fall from a bicycle resulting in some overextension at the hip joint, eventuated a few days later in increasingly threatening symptoms similar to those of appendicitis but upon operation a retroperitoneal hematoma without evidence of infection was the sole finding. The records of the surgical department of the hospital where this case had been handled (St. Goeranskrankenhaus Stockholm) during the years 1930 to 1936 inclusive disclosed another instance in which an allegedly stretching injury at the hip joint resulted in the removal of a normal appendix and a case in which overexertion (unaccustomed bicycle pedaling) led to symptoms indicating appendectomy. The appendix in the latter case seemed to be normal upon removal but microscopically it disclosed chronic inflammatory changes. Two patients who following accustomed exercise in the gymnasium developed peritonic symptoms were found at operation to be actually suffering from an acute appendicitis. In another case a laborer leaning over a bar in trying to lift a heavy weight bruised the right lower quadrant and four days later was proved to have a walled off retroperitoneal abscess and a badly micked adherent appendix which was almost discontinuous at the point of adherence. From another hospital came the report that a seamstress had suffered a fall and struck the right lower quadrant on the pavement. This allegedly made worse an al-

ready longstanding vague abdominal symptom complex and at operation a month later retro peritoneal approach to the appendiceal region uncovered an abscess which was conceded to be of probable appendiceal origin. Finally there were three reports in the proceedings of the Swedish Compensation Board (Reichsversicherungsanstalt)—one of a sailor falling into the hold of a vessel and injuring the lower abdomen with rupture of the appendix who received compensation another of a wood chopper who was struck in the upper abdominal region by a tree trunk and presented a perforated appendix to whom compensation was denied and a third of a salesman who was thrown with his lower abdomen against the steering wheel of a car in whom a gangrenous appendix was found and to whom compensation was denied. The cases complete the author's review of the more recent Swedish literature.

An extensive examination of the entire medical literature discloses that the majority of the cases are of the same general character and occur following a more or less severe trauma particularly to the abdominal region the symptom suggesting appendicitis and at operation there is found to be present an appendicitis attack in no way differing from non-traumatic appendiceal inflammatory processes. A exhaustive study however led Grettie to the conclusion that the significance of trauma as the cause of post-traumatic pathological conditions in the appendix has been very frequently overestimated and that the appendix is much more frequently the seat of old invalidating changes or in an inflammatory state at the time of the accident than is generally assumed. In the cases so far operated upon it was scarcely possible to determine to what extent the duration and the final issue of the disease were influenced. Febrile conditions appearing immediately after the injury would suggest an already developing inflammatory process. Early operation is necessary in these cases with careful study of the removed organ for evidences of recent trauma or for old cicatricial processes. Fecaliths may perhaps interfere with the self emptying function of the appendix. The history must be carefully taken and a study of the sedimentation rate of the blood must be made since Troell (1925-26) has shown that in appendicitis the sedimentation rate is at first normal and only rises to high values twenty-four hours later. In one case compensation was refused partly on the basis of an erythrocytic sedimentation rate of 23 mm within twenty-four hours following the trauma.

JOHN W. BRENNAN, M.D.

Elman R. Peritonitis Due to Ruptured Acute Appendicitis in Children Influence of Delay on the Operative Mortality. *Am J Digest Dis* 1939 5: 804.

This paper deals with a study of the results obtained in the treatment of peritonitis due to ruptured appendicitis in children under fourteen years of age. In general there are two points of view con-

cerning the management of such cases. From one point of view immediate operation to remove the source of infection is advisable while from the other postponement of the operation is urged. In the literature on this subject it is difficult to gather data regarding children at least on the relation between mortality and the period elapsing between the child's admission to the hospital and operation.

The clinical data represent a series of 181 cases in children with a final diagnosis of acute appendicitis which ruptured and resulted in a local or general peritonitis. All of these cases were arranged according to the time elapsing between admission and operation and were further subdivided into toxic and non-toxic groups. It was not difficult to divide the cases into the latter two groups for in most cases the general appearance and behavior of the child was more indicative of toxicity the existence of severe prostration was always assumed to be of great significance. There were 33 patients in the toxic group. It is not true necessarily that the difference in toxic manifestations was always due to a difference in the duration of the disease. Many of the children in the toxic group had been taken ill but from twenty-four to forty-eight hours before admission whereas a number of those in the non-toxic group presented a history of having been ill several days before the onset of the attack. It must be true that the virulence of the organism played an important role in the severity of the general reaction. Obviously any delay immediately following the onset which can be determined allows rupture to occur and increases the mortality tremendously. Once rupture has occurred the duration of the disease still plays an important role in mortality but the virulence of the organism plays an equal if not greater part.

The mortality for the whole group of 181 cases was 15.5 per cent in the non-toxic group the mortality was only 6 per cent while in the toxic group 57 per cent of the children succumbed. In arranging all cases according to the hour of operation the mortality shows no consistent trend in the group operated upon at various intervals following admission. In considering all cases there is no progressive lowering of the mortality with increasing delay. A mortality of 14.5 per cent occurred in the case of children operated upon within eight hours following admission whereas in those operated upon after eight hours 18.5 per cent died. This difference is too small to be of much significance.

More decisive findings are observed when the cases are separated into toxic and non-toxic groups. It is in the toxic group that the period of time elapsing between admission and operation seems of definite significance. A mortality of 10 per cent in the cases of children operated upon at once in contrast to 30 per cent in those operated upon from nine to twenty-four hours later indicates the value of delay in this type. The reason is obvious when one considers that most of these children in the toxic group were extremely prostrated dehydrated had

had no rest and had often been ill treated at home. The child should be put to bed given good nursing care and parenteral fluids he should be rested and given a transfusion if necessary and dilatation of the stomach should be relieved. If all these requirements are met before operation (and the general condition has improved enough) the mortality will be cut more than one half.

In the non toxic group the findings are in reverse to those in the toxic group. The mortality was lowest (3.5 per cent) in the children operated upon within eight hours while it was 15 per cent in those operated upon eight hours or longer after admission. Thus in patients in good condition delay increases the mortality.

The difference in mortality may be graphically expressed as follows:

	Mortality
Toxic cases operation within eight hours after admission	70 per cent
Toxic cases operation after eight hours	30 per cent
Non toxic cases operation within eight hours after admission	3.5 per cent
Non toxic cases operation after eight hours	15.0 per cent

The danger of a policy of unqualified delay is obvious from these findings. The general practitioner does not realize that expectant or non operative therapy is reserved for a really small percentage of patients who should not have been permitted to develop peritonitis. It is often difficult to tell clinically whether there is a peritonitis and whether or not it is spreading. From the findings then the necessity for immediate operation is clear whether the appendix is ruptured or not and whether a peritonitis is present or not, provided the child is in a good condition to withstand the operation. If the child is not in such a state then delay is advised to enable non operative therapeutic measures to improve the general condition sufficiently to permit the operation. Thus the question of immediate or deferred operation is answered not so much by an estimate of the extent of the lesion but upon the extent to which the lesion has affected the general condition of the child.

HARVEY S. ALLEN, M.D.

Charrter and Barraya Abdominoperineal Amputation with Hysterocolpomy for Cancer of the Rectum (Amputation abdomino-périnéale avec hystérocolpomy dans le cancer du rectum)  
J. de chir. 1939 53 322

In a review of the results obtained in 158 operations for cancer of the rectum the author formed the following rule for the technique of radical removal of cancer of the rectum: abdominoperineal amputation and sigmoid depression without artificial anus in selected cases with artificial anus in others; the peritoneum is completely closed and the pelvic cellular tissue adequately drained. No closed in testinal cul de sac is preserved. Certain cases in

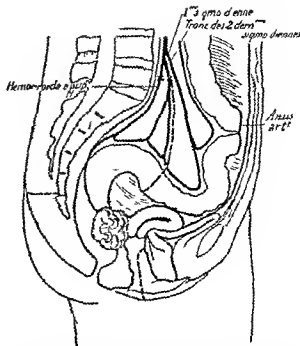


Fig. 1. Schematic section showing the extent of the exeresis by abdominal amputation combined with hysterocolpomy. The usual origin of the sigmoid vessels. A single ligature is placed in the mesenteric artery between the first sigmoid and the trunk of its two branches.

which the neoplastic process has invaded the female genital organs require removal of a part of the genital tract. Unless technically impossible this should be done *en bloc*. In some cases surgeons have removed the genital organs to facilitate approach to the rectal cancer. This is not justifiable in the opinion of the authors. However in cases in which the genital organs are included in the carcinomatous process such a procedure may save the life of the patient. In cases of low cancer involving the inferior two thirds of the vagina and in which exploration has revealed an intact pouch of Douglas posterior vaginal cul de sac and isthmus a posterior colectomy will suffice, the uterus being preserved to insure better pelvic statics. In cases of cancer from 7 to 10 cm. from the margin with invasion of the pouch of Douglas and isthmus it is better to perform an extensive colpohysterectomy combined with the abdominoperineal amputation. Rectal amputation is supplemented by a Wertheim operation. The problem of elimination must then be met. In 1 case the depressed sigmoid formed a satisfactory anus in the lower part of the sacral concavity. In some fortunate cases a perineal depression of the sigmoid obviated the necessity for an artificial anus. In other cases a permanent iliac anus was established. The iliac anus is established in a preliminary operation.

The extirpation of the cancer is accomplished in two stages namely an abdominal stage with dissection of the two ureters and bladder which permits isolation of the uterus, parametrium upper part

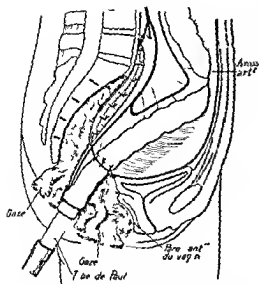


Fig 2 Schematic drawing showing depression of the colon peritonization and drainage after completed operation

of the vagina the rectum and its sheath. The mesentery is united and the whole mass is removed in a second stage or perineal stage which follows immediately and is completed by resection of the depressed sigmoid. During the days following the establishment of an iliac anus the patient is vaccinated with three doses of propion at intervals of two days.

The second operation is performed fifteen days after the first under spinal anesthesia according to Jones. The abdominal stage includes median pubo-umbilical incision, exploration of the abdominal cavity with careful search for distant lesions (distant peritoneal metastases constitute a contra-indication) and careful palpation of the pelvic mesocolon and accessible glands. A fixed adenopathy precludes any chance of successful operation. If none of these contraindications is present the lesion is examined with regard to its location in the intestine its axial and peripheral extent and its mobility in the sacral plane. The lesion is usually adherent to the genital organs. The next stage is conducted like the beginning of a radical hysterectomy by division of the ligaments and dissection of the ureters. The lateral and anterior surfaces of the vagina are then liberated. Finally in the rectosigmoid stage the vessels are ligated and the lateral and posterior surfaces of the rectum are liberated. The sigmoid is depressed and its lowest point marked for future resection. This point must not be too close to the lesion. A careful exploration of the vessels is needed to determine the site of division according to the anatomical distribution. Liberation of the posterior surface of the rectum is easy when the mesentery and vessels have been cut. The plane of cleavage

should be chosen sufficiently near the sacrum to make sure that one is proceeding posterior to the rectal sheath. Hemorrhage indicates that the plane of cleavage chosen has been too far anterior. The detachment should be made in the vicinity of the sacrococcygeal junction. A few layers of gauze are introduced before the abdomen is closed to absorb septic secretions and peritonization is then undertaken. In this stage one has attained isolation of the recto-uterovaginal mass, division of the rectosigmoid vessels, peritonization and localization and retraction of important vessels and the ureters.

In the perineal stage the excision of the organs is completed and peritonization finished. A purse-string suture closes the anus. A V-shaped cutaneous incision is made, the two branches terminating at the union of the posterior and two anterior thirds of the labia minor and the apex at the point of the coccyx if this is short or at the sacrococcygeal articulation if it is long. The classical routine is then followed with retraction of the cutaneous flaps, resection of the coccyx, division of the levators, rectosacral detachment and completed section of the vagina and of the attachments of the recto-vaginal mass. Peritonization is then completed, the intestine resected and a Paul's tube introduced. Drainage is afforded by 4 large iodoform gauze drains. A vesical catheter is introduced and kept in place for from eight to twelve days with the usual precautions. Postoperative shock is considerable as a rule. Serum cardiotonics and blood transfusion will aid the patient through this first period. Occasionally Vincent's anti-gangrene serum has been found of value (30 to 40 c.c. daily). After from twelve to fifteen days the wound begins to granulate but heals slowly. After from two to two and one-half months a depression admitting two fingers will remain. The anterior surface is constituted by the vaginal wall which little by little extends to meet the epidermic covering of the perineum.

The technique and its details may be modified to suit various individual indications. Thus if the uterus is fibromatous a high subtotal hysterectomy may precede the abdominal stage. In a case a rectal cancer had invaded the stump of an old subtotal hysterectomy. The cervix and bladder were isolated preceding the other stages. The colon may be very short in some cases when it may have to be severed below the iliac anus. Detailed reports of 7 cases are included.

LOUIS SCHANCK MOORE

#### LIVER GALL BLADDER PANCREAS AND SPLEEN

Cova P. L. and Tempini G. Experimental Research on the Roentgenographic Anatomy of the Extrahepatic Biliary Ducts Excluding the Gall Bladder (*Ricerche sperimentali su anatomia radiografica delle vie biliari extraepatiche escluse la cistifellea*). *Radiol med* 1939 26 226

Cova and Tempini describe in detail the accepted anatomy of the extrahepatic biliary tract and discuss

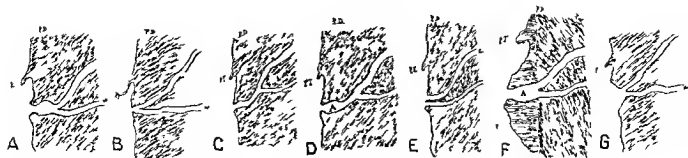


Figure 1 Various modalities of termination of the biliary pancreatic duct. PT plica transversalis, DP duodenal wall A ampulla PL hypertrophic mucosal fold with longitudinal direction

the various types of termination of the biliary pancreatic duct found in their studies (Fig 1) which were conducted on 44 cadavers of individuals varying in age from seven years to advanced senility. From 15 to 25 ccm of a weak solution of barium sulfate mixed with potato starch were slowly injected through an apical cholecystostomy after evacuation of the bile and the first few ccm of the solution were allowed to flow into the duodenum to avoid differences in opacity due to admixture of bile. The cholecystostomy opening was closed after the injection was completed. A first roentgenogram was taken in anteroposterior exposure and then the duodenal mucosa corresponding to Vater's orifice was clamped and slight pressure was exercised on the gall bladder to distribute the solution evenly in the biliary tract, after which a second roentgenogram was taken in the same position, and often a third in right oblique posterior position, in order to obtain total representation of the entire biliary tract.

In sagittal exposure the biliary tract is included within an area limited by lines passing through the upper border of the eleventh dorsal vertebra above the transverse process of the fourth lumbar vertebra below and the prolongation of the middle clavicular line laterally. The biliary tract is rarely superimposed on the spine. It shows the form of a curve with lateral and anterior concavity, the radius of the curve becoming shorter as the cystic duct lengthens. The biliary ducts are generally long and narrow in longilinear types, and short and wide in brachylinear types. In children, the biliary ducts are of about the same caliber in their entire course (Fig 2).

Good visualization of the entire biliary tract was obtained in most cases. The hepatic ducts had a diameter varying from 2 to 5 mm and a length of from 15 to 30 mm; their caliber was generally uniform and they were found between lines running through the upper border of the eleventh dorsal and

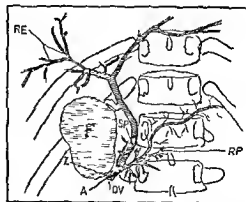


Figure 2 Child aged seven years Termination of the biliary tract as in Figure 1 A ampulla OV closed Vater's orifice RF intrahepatic branches RI intrapancreatic branches SP beginning of pancreatic tract Z indentations due to crypts of the biliary glands

the base of the first lumbar vertebrae. The common hepatic duct had a diameter varying from 3 to 15 mm and a length of from 2 to 7 cm. its caliber was larger in its distal part and it was found between lines running through the intervertebral disk between the eleventh and the twelfth dorsal and the base of the third lumbar vertebrae. The cystic duct (diameter from 2 to 5 mm and length up to 8 or 9 mm) ran obliquely or transversely was tortuous and made a horizontal T or a V on joining the hepatic duct. It was found between lines running through the base of the eleventh dorsal and the upper border of the third lumbar vertebrae. The choledochus (diameter from 5 to 17 mm and length of from 2 to 10 cm) was straight or slightly arched and ran obliquely from above downward to the right and the front it could be divided into three parts: (1) suprapancreatic which may be absent altogether; (2) pancreatic which is narrowed and (3) subpancreatic or intrapancreatic running in the duodenal wall. The diameter of the pancreatic part decreased rapidly to form a funnel ending in a filiform canal and was joined medially by the duct of Wirsung which was visualized for about 1 cm terminally the filiform canal may curve suddenly to the right perpendicularly to the duodenum. Injection of the opaque substance under moderate pressure changed the roentgen aspect of the biliary tract: the pancreatic narrowing disappeared the filiform part was dilated and the ampullary formation when it was present became evident. Obstruction of Vater's orifice may make Wirsung's duct visible in its entire course. The presence of glands and crypts along the biliary tract may give an irregular appearance to its borders and differences in age introduce important morphological changes. **RICHARD KETTEL, M.D.**

**Wolfer J. A.** Further Evidence That Reflux of the Pancreatic Juice May Be the Etiological Factor in Gall Bladder Disease. *Ann Surg* 1939 109 18.

It has been suggested that obstruction of the cystic duct represent the primary cause of gall

bladder disease and that infection when it does occur is a secondary phenomenon. In many instances however no obstruction can be found. Judd suggested a possible chemical cause for disease of the gall bladder in these cases. Wolfer as a result of considerable experimentation on dogs has been able to show that pancreatic juice when introduced into the gall bladder produces pathological changes in the wall of the gall bladder and the possibility that pancreatic juice may enter the gall bladder has been demonstrated. India ink introduced into the terminal end of the common duct of the dog was later recovered in the gall bladder. Attention was also called to the anatomically proved common pathway between the pancreatic and biliary tracts in 284 of 652 specimens examined by various investigators. Also recent cholangiographic studies have demonstrated a physiological common pathway between the two ducts.

Any obstruction at the sphincter of Oddi be it spastic or organic will result eventually in the passage of pancreatic juice into the gall bladder in those instances in which a common pathway is present. The agent which activates the pancreatic juice may be enterokinase (supposedly derived from the mucosa of the gall bladder) a substance liberated by broken down cells or contaminated pancreatic juice. One tenth normal sodium bicarbonate solution (the concentration of alkalinity in pancreatic juice) may also produce a violent reaction in the mucous membrane. With the theory that the reflux of the pancreatic juice may be the cause of gall bladder disease in mind it is recommended that some wide pread observations be carried out. They should include the following: (1) repeated examinations of the drainage for amylase in all cases of gall bladder and common duct drainage; (2) cholangiographic studies to visualize the pancreatic duct in all cases of gall bladder and common duct drainage and (3) study of the possibility of early history which is suggestive of biliary dyskinesia in all cases of gall bladder and duct disease.

**MANUEL E. LICHTENSTEIN, M.D.**



# GYNECOLOGY

## UTERUS

**Pelkonen E** Developmental Mechanism of the Metrorrhagias in Cases of Pedunculated Submucous Myomas (Zum Entstehungsmechanismus der metrorrhagischen Blutungen bei den gestielten submukösen Myomen) *Acta Soc. med. Fennicae Duodecim* 1939 Ser B 24 No 23

As an explanation of the frequent and serious intermenstrual bleeding in submucous myomas, especially as to why it is so characteristic of the pedicled variety, S. E. Wichmann, head of the department of gynecology at Helsingfors (whence this study originates), erected the so-called caput succedaneum theory. According to the theory, the pressure of the muscular walls of the uterus against the opposed sides of the tumor—perhaps as the result of abnormal contractions induced by the irritation or the pull of the pedicle on the uterine wall, or as the result merely of a passive resistance to dilatation by the cervix in those cases in which the uterus is attempting to extrude the mass into the vagina—results in an engirdling zone of compression which interferes with the return of blood and lymph.

Wichmann based his theory entirely upon clinical considerations; however, Pelkonen has been trying to procure histological substantiation for it. With this end in view, the latter has made histological preparations from the lower pole from the so-called girdle contact zone and, finally, from regions above this contact zone in 4 cases of pedicled submucous myoma. (In a fifth case the submucous myoma, included for purposes of comparison, was protruding but was not yet pedicled. Findings resembled the others only they were less pronounced.)

In all specimens from the lower pole the findings were remarkably uniform: the covering epithelium appeared somewhat thickened with an abundance of mucous and submucous endometrial gland structures which stained poorly over extensive areas and in many places were lifted away from the subjacent tissues by massive submucous hemorrhages or were even entirely sloughed away. Extending throughout the mucosa and down into the tumor tissue itself were exhibited various stages of degeneration: lymph and blood stasis and interstitial per rheum and diapedesis hemorrhagic extravasations. This histological picture corresponded to the macroscopic appearance of the tumor at removal: the lower pole of which was always dark reddish in color, somewhat edematous and in places actually bleeding.

The specimens from the zone of girdle contact, on the other hand, exhibited flattening of the covering epithelium, anemic dense appearing tissues, closely crowded nuclei, and other evidences of considerable pressure. Those from above the contact girdle zone were typical and need not be discussed. (The specimens from the endometrium of the uterus disclosed

in every case that the endometrium was in the phase of secretion.)

From this study, therefore, Pelkonen believes that, although he has not unqualifiedly substantiated the truth of Wichmann's theory, he has at least erected a broad histological foundation for its acceptance.

JOHN W. BRENNAN, M.D.

**Martines S** Changes in the Endometrium in Fibromyomas of the Uterus (Le modificazioni dell'endometrio nei fibromiomi dell'utero) *Riv. ital. di ginec.* 1939 22 25

In connection with his histological description of 37 cases of uterine fibromyoma, Martines considers the condition of the ovaries at the time of the surgical intervention. As it is impossible to draw a distinct line between subserosal interstitial and submucosal fibromyomas, he bases his classification on the prevailing seat of the tumors; thus he has examined 20 fibromas of prevalently subserosal development (3 of which were intraligamentary), 11 of prevalently interstitial development, and 6 of prevalently submucosal development.

In the 17 subserosal cases, he has observed sclerocystic degeneration of the ovaries 8 times, the presence of follicular cysts 3 times, and of lutein cysts 4 times. In the 3 intraligamentary cases, the ovaries presented changes similar to those found in the subserosal cases. In the 17 interstitial and submucosal cases combined, sclerocystic degeneration of the ovaries was present 12 times, a lutein cyst was found in 3 cases, and a large follicular cyst in 1 case.

The histological examination showed a condition of glandular hypertrophy and hyperplasia common to all cases, but to a higher degree in the cases of tumor of intraligamentary and subserosal development. So-called cystic hypertrophy was frequently present. In many cases, the metaplasia of the epithelium of the superficial layer of the endometrium toward the cubical or polygonal form was characteristic.

The histological findings exclude positively the possibility of attributing the changes of the mucosa to an inflammatory process, except in certain cases of fibroma with cavity development. On the other hand, it is necessary to take into consideration the ovarian changes which are constantly found in the presence of the tumor, no matter where its seat or its development may be. These changes can be summarized as sclerocystic degeneration of the ovarian parenchyma. In many cases, the metaplasia of the superficial epithelium of the uterine mucosa toward the cubical or polygonal form was associated with the presence of follicular cysts of moderate volume. Consequently, the changes of the endometrium in fibromyoma of the uterus are intimately related to characteristic pathological conditions of the ovary, just as the development itself of the tumor is inti-

the base of the first lumbar vertebrae. The common hepatic duct had a diameter varying from 3 mm and a length of from 2 to 7 cm. Its caliber was larger in its distal part and it was found by lines running through the intervertebral spaces between the eleventh and the twelfth dorsal vertebrae. The cystic duct (diameter from 2 to 5 mm and length up to 10 mm) ran obliquely or transversely was tortuous and made a horizontal T or a V on joining the hepatic duct. It was found between lines running through the base of the eleventh dorsal and the upper border of the third lumbar vertebrae. The choledochal duct (diameter from 5 to 17 mm and length of from 10 cm) was straight or slightly arched and obliquely from above downward to the right. In the front it could be divided into three parts: (1) suprapancreatic which may be absent altogether; (2) pancreatic which is narrowed and (3) suprapancreatic or intrapancreatic running in the duodenal wall. The diameter of the pancreatic part decreased rapidly to form a funnel ending in a filiform canal, and was joined mesially by the duct of Wirsung which was visualized for about 1 cm terminally. The filiform canal may curve suddenly to the right perpendicularly to the duodenum. Injection of the opaque substance under moderate pressure changed the roentgen aspect of the biliary tract: the pancreatic narrowing disappeared, the filiform part was dilated and the ampullary formation when it was present became evident. Obstruction of Vater's orifice may make Wirsung's duct visible in its entire course. The presence of glands and crypts along the biliary tract may give an irregular appearance to its borders and differences in age introduce functional and morphological changes. RICHARD KEMM more or less

Wolfer J. A. Further Evidence That the Grade III Pancreatic Juice May Be the Etiologic Factor in Gall Bladder Disease. *Annals* demonstrated 187

It has been suggested that the relation was shown between the cystic duct represents the patients was fifty eight years of age. Of these patients 23 were nulliparas, 23 were multiparas. Of the 23 nulliparas 5 or more children had had the cardinal symptom. Thirty-three of the multiparas had never been established. Of the 23 nulliparas 10 reported continued and excessive vaginal bleeding occurred in the rest of the chief symptom was vaginal discharges described as blood stained, profuse and foul smelling. Progress was characterized by weakness and rather than by pain. In 12 of the uterus was absent in the majority and in 5 the uterus was fixed. In 34 patients of normal size in 7 and

45 of carcinoma of the body of the uterus. The diagnosis was established by the symptoms and physical

large. The association of the body of the uterus in these patients. There have been attributed the authors discuss the problem involved in the diagnosis of carcinoma of the uterus. The authors present an indication to be followed is primarily important. The authors discuss the technically operable active irradiation total active high voltage therapy. The authors discuss the technically operable

It is to be observed that biopsy of the body of the uterus is not satisfactory. The grade of the disease and the duration of the disease are not another. The authors discuss the most important of the body of the uterus.

M. D.

Corpus  
of the  
uterus

Keller and V. The corpus uteri observed from 1919 to 1934. In 1930 there was a pause in the average age of 13 years. The diagnosis in most cases was made by curettage with microscopic examination of the mucosa so obtained. This procedure was made in cases in which there was evidence of an associated benign tumor (1) indicated a surgical operation with the uterus. The authors are convinced that the diagnosis of cancer of the uterus is the most certain and satisfactory of establishing the diagnosis of cancer of the uterus. In 1 of their cases however curettage followed by a fatal embolus and in another phlebitis with a few small emboli.

In 13 of their cases the cancer of the corpus was associated with other uterine or ovarian tumors. In 5 cases with uterine fibroma, in 5 cases with cyst (1 of the corpus and 4 of the ovary) and in 2 cases with carcinoma of the cervix. The association of fibroma or ovarian cyst with carcinoma of the corpus is not unusual but the association of a malignant tumor of another type in the same organ is rare.

Of the 82 patients in this series 55 were operated upon, 24 were treated by radiotherapy, and 3 were not treated. The untreated group included the patient who died from embolism after curettage the patient who developed thrombosis with multiple emboli after curettage and a third patient who refused all treatment. These 3 cases were all operable so that the percentage of operability was high—70.7 per cent (58 of 82 cases). This high percentage of operability is not unusual in cancer of the corpus and is due to the fact that this neoplasm remains localized in the uterine cavity for a considerable time. Of the 24 cases classed as inoperable and treated by radiotherapy 6 were inoperable because of local metastases and 18 because of the poor general condition such as advanced age obesity and cardiac insufficiency.

Total abdominal hysterectomy was done in 22 of the 55 patients operated upon vaginal hysterectomy in 26 and subtotal hysterectomy in 6 (later made total in 1 case). There was 1 failure following operation by the vaginal route which was followed by exploratory laparotomy. There were 14 patients in whom some postoperative complications developed (25.4 per cent) the most frequent of these were phlebitis cystitis pyelonephritis and partial rupture of the operative wound (2 cases). There were 7 operative or postoperative deaths (12.7 per cent). One was due to pulmonary embolism after vaginal hysterectomy 1 occurred in the case in which vaginal hysterectomy was attempted and failed and 5 occurred after abdominal hysterectomy because of peritonitis in 3 cases (with septicemia in 1) and on account of bronchopneumonia or pulmonary edema in 2 cases. Total abdominal hysterectomy was employed chiefly in women in good general condition in nulliparas and in those women in whom the cervix could not be brought down easily. The vaginal route which is attended with less shock was used in these patients in those whose general condition was less satisfactory and in multiparas in whom the cervix could be brought down easily.

In the cases treated by radiotherapy radium by Regaud's method deep x ray therapy or a combination of the two methods was used.

Of the entire series of patients 60 were treated from 1919 to 1932 and of these 44 were operated upon. In this group there were 6 postoperative deaths 11 patients could not be traced 4 have died (3 from recurrences and 1 from an intercurrent disease twelve years after operation) and 23 are living and without recurrence for more than four years after operation all but 5 of the last group have passed the fifth year. Disregarding the case of death from intercurrent disease there were 23 cures in 43 cases (53.4 per cent).

There were 14 cases treated by radiotherapy in the period from 1919 to 1932 7 by radium alone 3 by deep x ray therapy and 4 by radium and x ray therapy combined. Of these 5 could not be traced 4 have died from the cancer and 5 have been living and free from recurrence for more than four years

thus the percentage of cures was 35.7. While this figure is lower than that of the operated group, it must be remembered that only inoperable cases were treated by radiotherapy. Operation the authors believe, is the treatment of choice in cases of cancer of the corpus uteri that are operable, in inoperable cases radiotherapy is indicated as it may cure some cases beyond the reach of surgery.

MICHAEL M. MEYERS

**Repetti, M.** Late Results of Surgical and Actinic Treatment of Cancer of the Female Genital Apparatus with Special Consideration of Cancer of the Uterine Cervix (Risultati a distanza della terapia chirurgica e attinica del cancro dell'apparato genitale femminile con speciale riguardo al cancro del collo dell'utero) *Folia demographica gynaecologica* 1938 35 659

Repetti reports the results obtained with surgical and radium treatment of 266 cases of uterine cancer admitted to the clinics of Parma and Pavia from 1925 to 1934 in most cases from five to twelve years have elapsed since the treatment. Generally the radium treatment included the vaginal application of from 2 to 4 tubes of 10 mgm. of radium filtered by 2 mm. of platinum followed by uterine application of 2, 3 or 4 tubes of the same content filtered by 1 mm. of platinum in rubber from ten to fifteen days were needed for the irradiation. The 266 cases included 162 cancers of the uterine cervix 33 of the uterine body and 11 of the vagina and vulva. He compares the results of surgical and radium treatment obtained at various other institutes with those he reports and concludes that the school to which he belongs is working in the right direction. He uses the classification in four groups adopted by the League of Nations.

The cases of cancer of the uterine cervix treated with radium gave for all the groups considered together an absolute percentage of cure of 26.92 and a relative percentage of 28.56 the percentage of cure was 80 in Group I 45 in Group II 16 in Group III and 0 in Group IV. On the other hand with surgical intervention there was a relative global percentage of cure of 52.9 and an absolute percentage of 40.90 the percentage of cure was 68.75 in Group I and 31.25 in Group II. The percentage of cure was 50 in borderline cases in which surgical treatment was associated with radium therapy.

Comparison of the percentages of cure death and operative mortality in the operable cases (Groups I and II) treated with radium and surgery showed that radium treatment gave a total percentage of cure of 58.6 while surgery reached a percentage of 52.9 with a primary uncorrected mortality of 0 per cent for radium and of 6.8 per cent for surgery. After discussing the therapeutic indications, the influence of the histological form of the cancer on the final results and the deaths by recurrence the author points to the rare and slight complications caused by radium the low percentage of primary operative mortality and the importance of prophylaxis.

lactic irradiation with radium in association with surgical treatment

In cancer of the uterine body the percentage of cure by surgical treatment is 55 which corresponds to the figures given by other schools the percentage of cure with radium treatment amounting only to 10

is explained by the fact that the patients were of advanced age and presented marked extension of the process. However the small number of cases treated and the advanced stage of the disease when the patients came under observation do not allow the author to form an exact concept of the value of radium treatment in cancer of the uterine body or of surgical and radium treatment in cancer of the vulva and of the vagina

In conclusion the results obtained in operable cases of cancer of the uterine cervix are in general good with surgery as well as with irradiation but the latter offers some advantages and presents fewer operative risks in inoperable cases in which nothing is to be gained by surgery but amelioration within limits and cure may be obtained with radium at times the latter treatment should be used. In cancer of the uterine body of the vulva and of the vagina surgery is still recommended

RICHARD KEMEL M D

#### ADNEXAL AND PERIUTERINE CONDITIONS

Quinto P Primary Carcinoma of the Salpinx (Sul carcinoma primitivo della salpinge) *Riv Ital di ginec* 1939 22 3

Primary carcinoma of the salpinx is rare as only about 350 cases have been reported in the literature. Quinto describes a bilateral primary alveolopapillary carcinoma of the tubes with omental metastases in a woman aged thirty six years who died from a recurrence of the tumor six months after the radical operation.

Most cases of primary carcinoma of the salpinx develop during the fifth decade of life and are unilateral. The diagnostic difficulties were increased in the present case by the fact that this woman had had a puerperium complicated by inflammation of the adnexa four years previously after a normal pregnancy. It was more natural to suspect bilateral chronic adnexitis than a carcinoma especially as the symptoms of pain and leucorrhea presented by the patient did not contradict the diagnosis of adnexitis. According to most authors the symptoms of tubal carcinoma are supposed to acquire peculiar characteristics. However the fact is that the character of the pain varies greatly as does also the leucorrhea. In connection with the latter the differential diagnosis between carcinoma and hydrosalpinx is not difficult because in the former the leucorrhea is intermittent only in the very early stages of the disease and later the size of the tumor continues to increase notwithstanding abundant loss of fluid. A more important sign of the presence of carcinoma would be loss of blood or of serosanguineous fluid and the diagnosis would be conclusive if neoplastic

cells were found in the vaginal discharge. Changes in menstruation and disturbances of micturition may occur but are not typical of tubal carcinoma.

Nothing more is known about the cause of primary tubal carcinoma than of any other type of malignant tumor. Histologically tubal carcinoma may be of papillary adenomatous or alveolar nature the alveolopapillary form would have the greatest tendency toward invasion of the tissues. The primary bilaterality of the tumor in the present case must be admitted because the right tube remained permanently obstructed from the previous inflammation and transfer of tumorous elements by contiguity or by the lymphatic or circulatory route was out of the question. The omental metastases are to be considered as attachment metastases due to issue of tumoral material through the abdominal orifice of the left tube. Because of the difficulties of the diagnosis the prognosis of tubal carcinoma is nearly always unfavorable. Radical surgical intervention is the only rational treatment even if only one tube is found involved removal of the uterus and adnexa is indicated. The postoperative prognosis is also unfavorable on account of the tardiness of the intervention. Radium therapy may be used in case of vaginal metastasis.

RICHARD KEMEL M D

Pierre C Ovarian Apoplexy a Few New Observations (L'apoplexie ovarienne a propos de quelques observations nouvelles) *Rev franc de gynec et obst* 1939 34 65

An anatomical study of a certain number of cases of ovarian apoplexy convinced the author that the classical division of ovarian hemorrhages into two groups viz bleeding in the stroma and in the germinal tissue should be abandoned. The so called apoplectic process is found in the majority of cases although massive bleeding is rare. Only quantitative difference exists between the hemorrhagic lesions of the stroma the active tissue and the entire organ.

Congestive phenomena and perfollicular hemorrhagic suffusions constitute the initial stage of the apoplectic process. Similar conditions are found as a rule in an attenuated form during the course of the normal maturation of the follicle and therefore apoplectic accidents may be considered as a disturbance of the ovarian cycle. Apparently various transitions exist between the normal process of ovulation and the massive hemorrhages in the ovaries.

There is no symptomatology characteristic of ovarian apoplexy and there is no parallelism between the intensity of the anatomical lesions and the clinical phenomena. Acute forms may simulate an acute appendicitis or a rupture of an ectopic pregnancy. Operative findings and the results of histological examination demonstrate the existence of latent forms which seem to be relatively frequent and may be responsible for menstrual or intermenstrual pains.

Conditions under which the ovarian apoplexy occurs and also certain experimental findings point

to the rôle of hormonal factors in the genesis of ovarian hemorrhages. A blood dyscrasia or an abnormal fragility of the capillaries may act as contributing factors. As the hemorrhages originate in the zone rich in terminal branches of the neurovegetative system it may be concluded that a disturbance of the equilibrium of the sympathetic system of hormonal origin may be responsible for an ovarian apoplexy. Certain observations demonstrate the importance of a sudden discharge of a large amount of prolactin. JOSEPH K. NARAT, M.D.

### MISCELLANEOUS

Thompson G. J. Transurethral Operations on Women for Relief of Dysfunction of the Vesical Neck. *J. Urol.* 1939 41: 349.

A series of 24 cases of dysfunction of the vesical neck among women in which 35 transurethral operations were performed is presented.

The etiology of this disease was not definitely revealed by microscopic study of the tissue removed by transurethral operation. The hypothesis that it is caused by fibrosis in the sphincteric region seems fallacious in view of the fact that a considerable amount of fibrosis is found in normal tissue from this region. A possible explanation is that hyperplasia of the superficially lying epithelium or of the sphincter muscle occurs and causes urinary retention.

The results of operation were classified as excellent in 14 cases, good in 5 cases, fair in 4 cases, and poor in 1 case.

Removal of tissue from the entire circumference of the vesical neck is necessary to obtain a good result in all but exceptional cases in which only incision might suffice.

Observation of the patient by the urologist for a number of years following operation is advisable and treatment including dilatation with a Hohlmann dilator will probably be necessary in some cases in order to maintain normal vesical function. The transurethral operation can be repeated with benefit if the urinary obstruction recurs.

MacLeod D. Hormone Therapy in Gynecological Conditions. *J. Obst. & Gynec. Brit. Emp.* 1939 46: 15.

Acknowledgment is made by the author of the brilliant advances made in recent years in the chemistry and physiology of the endocrine glands. The disappointment experienced by many in the results of endocrine therapy in the more important functional disorders of women occurs because little discrimination is being employed in the use of this type of therapy. The cause of this is threefold: (1) the encouragement that the clinician gains from reading commercial brochures on the subject; (2) the fact that little harm results from the use of hormones in general; and (3) the tendency of functional uterine disturbances to recover spontaneously.

Four hormones are available for use in endocrine therapy. The estrogenic hormones extracted from the urine and the placenta are responsible for the development of the external genitalia, the breasts and the vaginal mucosa. They increase the size of the uterus and increase uterine sensitivity to contractions. They bring about the development of the hypertrophic phase of the endometrium and in association with the corpus luteum hormone, are responsible for normal menstruation. When given in large doses, or in small doses over a prolonged period, they will inhibit the gonadotropic activity of the pituitary gland. Estrogen is of value in the treatment of severe menopausal symptoms especially those following the removal of ovaries in young women. Its value is proven in the distressing condition of kraurosis, primary senile vaginitis and the vulvovaginitis of children.

So far as the treatment of amenorrhea is concerned it has been shown that when associated with the use of corpus luteum hormone the estrogenic substance will produce normal menstruation but it is incapable of inciting spontaneous activity, and is therefore of little value. Results of its use in primary dysmenorrhea occurring with a small uterus are unsatisfactory.

The corpus luteum hormone, progesterone, transforms the hypertrophic phase of the endometrium into a secretory phase. It is responsible for the safe nidation of the ovum, it is antagonistic to estrin, and inhibits uterine contractions. Its use is indicated in certain forms of uterine bleeding especially the pubertal or maturity types. It is of undoubted value in cases of threatened and recurrent abortion in which a physical cause cannot be found. The results are uncertain in those cases of dysmenorrhea which are due to excessive contractions.

Of the gonadotropic hormones the following are available for therapeutic administration: (1) the pituitary-like substance (anterior lobe) found in the urine of pregnancy which is known to have a luteinizing effect on the immature ovaries of mice; (2) the follicle stimulating hormone found in the serum of pregnant mares and in the urine of menopausal women shown to cause ovarian development and follicle formation in animals.

The first is theoretically indicated in cases in which the corpus luteum hormone is considered to be deficient for example in repeated abortion, functional bleeding and dysmenorrhea. It is indicated in functional amenorrhea in sterility and in all conditions of under activity of the ovaries. Results have not as yet justified the hopes that were entertained for it.

The fourth described, the androgenic hormone, acts by inhibiting the gonadotropic activity of the anterior lobe of the pituitary gland. It is also antagonistic to estrogen. In large doses it is capable of producing temporary amenorrhea and has been suggested for the severe cases of dysmenorrhea.

Before a decision is made to treat a case in which symptoms indicate a functional deficiency with

hormones the author suggests that attempts be made to determine which particular hormone is at fault only by such means can therapy be carried out in a rational manner. Urinary assays may be of some value while in endometrial biopsy there is a means of determining the presence of a functioning corpus luteum. The examination of vaginal smears helps to determine the effectiveness of estrogen.

In considering the undesirable effects following hormone therapy the author notes that since in practice it is rarely necessary to give large doses of estrogen for a very long time the risk of the development of malignant disease is negligible. Apart from the development of malignant disease prolonged administration of estrin may cause other harmful effects by inhibiting the gonadotropic activity of the pituitary gland. As a result of too high a dosage of estrin there may be unexpected uterine bleedings, symptoms of headache and nausea, and even swellings of the hands, face and eyes. It has been shown that wide fluctuation of the basal metabolic rate occurs from a single injection of 1000 I.U. of estrogenic hormone. The author notes the importance of metabolic observations when giving large doses of estrin to patients suspected of incipient hyperthyroidism.

Successful results of hormone therapy in functional gynecological disorders are mainly those following substitution therapy as in the menopausal state and conditions allied to it in abortions and in special types of uterine bleeding. The treatment of other endocrine disorders by such means is at present unsatisfactory. I especially is this true in the case of functional amenorrhea. The author believes that this unsatisfactory treatment is due to (1) the frequent absence of careful general examination of a patient in whom a menstrual disorder may be but a symptom of some general systemic disease (2) the fact that at present, we are unable to determine by biological assay the particular hormone at fault and (3) the habit of ignoring the psychological cause. This may play a very important part in functional amenorrhea.

Research and advances in endocrine physiology and chemistry have far outstripped those in therapy. More discrimination should be shown in the choice of cases. Further scientific research may solve the present difficulties of successful endocrine therapy in the treatment of some functional disorders of women.

HERBERT F. THURSTON, M.D.

Kellar R. J. and Sutherland J. H. Clinical Experiences with a New Synthetic Estrogen Still oestrol h (Diethylstilboestrol). J. Obst. & Gynaec. Br. & Ind. 1939 46 1.

A series of cases of menopausal syndrome senile vaginitis leucoplakia vulva inhibition of lactation and secondary amenorrhea was treated with the synthetic drug diethylstilboestrol. This drug produced results more or less similar to those of a natural estrogen and was active when given by mouth.

CHARLES BARON, M.D.

Anker H. The Treatment of Menstrual Disturbances with Follicular Hormone (Menstruations Störungen behandelt mit Follikelhormon). Acta obst. et gynec. Scand. 1939 19 9.

The histological picture that is regularly found in juvenile menorrhagia (glandular hyperplasia of the endometrium) has been explained by an overproduction of follicular hormone with simultaneous insufficiency of the corpus luteum hormone. Cystic degeneration of the ovaries with numerous unruptured follicle cysts has also been found when the corpus luteum did not develop. On the basis of this theory corpus luteum therapy was instituted but the results were not very encouraging and have not definitely shown that the absence of the corpus luteum hormone is at fault. If only B therapy is also not encouraging. Histologically the picture of glandular hyperplasia shows a striking similarity to that of the secretory phase of the mucosa, namely, the presence of markedly tortuous glandular tubes that often are deeper and wider than normal and show the effect of corpus luteum. The question therefore arises whether it is correct to assume the absence of this hormone.

This concept that the mucosa has been continuously influenced by the corpus luteum and is in the secretory phase but that the shedding is not complete and the bleeding originates from the blood-filled swollen partly necrotic mucosa has led to the idea that it is the follicular hormone and its effect that are missing in the development of the newly proliferating mucosa. This also explains the deficient activity of the musculature paralyzed by the lutein which contracts poorly around the bleeding blood vessels. Cases of juvenile menorrhagia often show genital infantilism—signs of insufficiency of the growth producing effect of the follicular hormone upon the myometrium.

The author reports 7 cases of menorrhagia including 6 of the juvenile type that were treated with large doses of follicular hormone. Two patients developed a quite regular estrus with hemorrhages of normal intensity and duration. Three others showed a decrease in intensity and duration of the bleedings but not regular estrus and an amenorrhea lasting several months before menstruation appeared. In 2 cases the menorrhagia continued but with slightly diminished intensity. One of these was not of the juvenile type. In view of the histological picture (glandular hyperplasia of the endometrium) observed in the curettings from 3 cases it seems that this condition should be treated with follicular hormone and not with corpus luteum hormone.

Of 5 patients with secondary amenorrhea or oligomenorrhea treated with follicular hormone or with combined follicular and corpus luteum hormones 3 reacted with hemorrhages, 2 showed improvement of the infantile symptoms and 1 prevented pregnancy after one year of normal married life. The hemorrhages appeared during or immediately after the end of the treatment with follicular hormone.

LOUIS NEUWELT, M.D.

**Custo E. L.** Behavior of Placental Tissue Transplanted in Parenchymatous Organs Its Hemostatic and Hormonal Action (Comportamento del tessuto placentare trapiantato negli organi parenchimatosi Sua azione emostatica e ormonale)  
*Folia demograph gynec* 1935 35 513

The experiments of Custo consisted of heteroplastic autoplasmic and homoplastic implantation of placenta in the liver kidney ovary or uterus or in 2 organs simultaneously of rabbits and guinea pigs. The pieces of placenta used were not more than 3 or 4 mm square and the animals were sacrificed to verify the fate of the graft after lapses of time varying from three to fifty days.

For the heteroplastic grafts in rabbits woman's placenta was used. The bed of the graft was prepared by producing a lesion on the selected organs in many cases by removing a small piece of tissue and the graft was applied by simple compression not lasting more than one minute. In the animals killed three days after the intervention the placental tissue showed rather marked signs of degeneration and no indications of proliferation or of infiltration of the organ to which it was applied. It was completely isolated from the organ by an accumulation of small cells present in the superficial layers of the organ. The liver kidney and ovary used did not show any changes but the uterus was slightly enlarged. In the animals killed six days after the intervention the parenchyma of the organs did not show any changes but the graft recognizable by its whitish color appeared as if it were surrounded by a thin membrane on the kidney and the liver. The inflammatory reaction of the ovary did not seem to be as marked as it

was in the other organs and the placental tissue was also less altered as some syncytial cells were still distinguishable. After twelve days the graft consisted of a small mass of whitish tissue of increased consistency and of decreased volume surrounded by a capsule of young connective tissue. It was undergoing degeneration and was infiltrated with calcium. The parenchyma of the organs was normal. After twenty days the calcium infiltration was still greater and more advanced changes were noted after thirty and fifty days. At no time had there been any new formation or any tendency to ward vascular proliferation.

The same results were observed following autoplasmic and homoplastic grafts of placenta in rabbits and guinea pigs examined at identical intervals of time. However extravasation of blood was noted between the graft and the organ and some large elements were found in the leucocyte infiltration. By the twentieth or thirtieth day degeneration of the placenta was nearly complete. Examination of the lungs did not reveal any metastatic inclusions of placental tissue.

Prompt hemostasis was observed in all except 2 cases after the graft was applied and it was nearly instantaneous when woman's placental tissue was used. This action is probably mechanical. As to the hormonal action of the grafts notable enlargement of the uterine horns was observed in 4 animals and was more marked in 3 of them which had received a graft of woman's placenta. This was due probably to the slow absorption of the folliculin contained in the disintegrating placental graft.

RICHARD KEMEL, M.D.



# TERATOMATOUS CHORIO-EPITHELIOMA IN THE FEMALE AND IN THE MALE

A Critical Study of the Literature for the Years 1935, 1936, 1937

ALBERT MATHIEU MD FACS Portland Oregon

## Report of 2 Cases in the Male

THOMAS D ROBERTSON MD Portland, Oregon

**C**HORIO EPITHELIOMA is a rare and malignant neoplasm which arises from the epithelium of chorionic villi. It may develop at any site at which there are living chorionic cells; therefore it may occur in teratomas of either the ovary or the testicle. Melot (25) says chorio-epithelioma can be the result of malignant evolution of embryomas arising especially in the testicle rarely in the ovaries; the thyroid, the kidneys, the intestines or the pancreas; and for this reason chorio-epithelioma has been observed in virgin women and in men. Marguerite Jaquenod (20) thinks that chorio-epithelioma in men and non pregnant women can always be traced to a teratoma which need not of necessity be located in the sex glands. Preston and Gay (28) are sure that primary chorio-epithelioma of the ovary arises without any preceding pregnancy because it is of a teratomatous nature and its origin in the ovary is analogous to a similar lesion of the testicle.

In a most thorough and instructive paper on primary chorio epithelioma of the ovary Simard (31) sets forth the opinion that the origin of this neoplasm is still open to discussion. He summarizes the various theories which have been suggested in explanation of chorio-epithelioma of the ovary as follows: (1) malignant transformation in the ovary of chorionplacental cells carried from the uterus or the tube following pregnancy; (2) malignant transformation in the ovary of trophoblastic elements following ovarian pregnancy; (3) ovarian metastases of primary chorio epithelioma of the uterus or of the tube; and (4) malignant transformation of the trophoblast in ovarian parthenogenesis as suggested by L. Loeb in 1911. Simard makes several interesting comments regarding Loeb's theory of malignant transformation of the trophoblast in ovarian parthenogenesis, and he quotes many authors in support

of the theory of the parthenogenetic origin of primary chorio epithelioma of the ovary. Thus the theory of the parthenogenetic origin of almost all the teratomas and the chorio-epitheliomas of the gonads is more and more generally accepted, that is teratomas originate from parthenogenesis in the adult ovary from androgenesis in the adult testicle and from ephebogenesis in the gonads before puberty. From the ectoderm of the teratomatous ova in the first state of their development would arise the chorio-epitheliomas independent of normal fertilization. The parthenogenetic hypothesis seems to offer a better explanation of the benign or malignant forms of the majority of the dysembryomas. Simard's classification of dysembryomas arising from sex cells is reproduced in Figure 1. Schwarz and Freund (29) suggest the same 4 possibilities for primary chorio epithelioma of the ovary.

According to Kirwin (22) Wlassow in 1900 reported four cases of testicular tumor and mentioned the striking resemblance which he had noted in two of them to the chorio epitheliomata seen in the uterus. Wlassow's work does not seem to have made much impression even in Europe.

Two years later in 1902 Schlagenhauser reported a further case and made a careful and well correlated evaluation of all the pathological and structural data which had accumulated up to that time. The name he suggested was *malignant chorio epithelioma of the testicle*. The appropriateness of this name he based upon his conclusion that the growth in question is genetically equivalent to the chorio-epithelioma seen in the female, and is originated in a teratoma.

Irvin Abell (1) considers chorio epithelioma of the male as among the believe it or nots of medicine and he remarks after believing for years that the tumor arose only as a pregnancy sequel its demonstration in the male afforded a



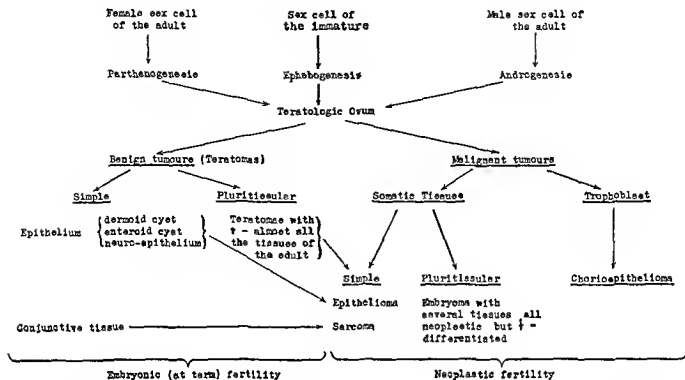


Fig 1 Classification of dysembryomas arising from sex cells (Simard L C Am J Cancer 1937 30 298)

paradoxical curiosity. Its mode of origin is still uncertain but is regarded as evidence of a metaplastic change in an embryonic ectodermic testicular structure which under certain unrecognized conditions is capable of producing this variety of tumor." Ogilvie and Mackenzie (26) aver that although a well recognized phenomenon, the appearance of chorio epithelioma in the male is nevertheless a rarity, and its origin is traceable to chorionic epithelium which is an element in teratoma of the testis.

The conception that at least part of the group of teratomas arise from totipotent cells which have the inherent capacity to originate all the tissues of a new person appears logical to Dickson (6). He quotes Ewing as saying that an important principle of the growth of teratomas is the tendency of one element to overgrow and suppress the others. In teratoma of the testis, chorionic epithelium appears frequently to do this, in teratoma of the ovary it is almost unknown. Dickson accepts the premise that chorionic epithelium *per se* is malignant and that when it is present, the absence or occurrence of malignancy is determined solely by the presence or absence of a capacity for defense by the host. He states "So far as is known chorionic epithelium in the male is invariably malignant. It has not been described as a benign constituent of teratomas in that sex. Ewing says that the adult tissues of teratomas give rise to benign growths and the embryonic tis-

sues originate malignant growths. Obviously, the adult tissues develop from the embryonic. In the development of a teratoma from a totipotent cell analogous to the development of the embryo, the embryonic tissues ordinarily should give rise to adult types. This cannot occur in the case of chorionic epithelium for it is a pure embryonic tissue and not destined to originate any adult type. Normally its destiny is to perform a definite function during gestation during which it is under control. It then dies. In the male its destiny is thwarted. Control is lacking. It exhibits, however, its physiological properties. The result apparently invariably is a malignant neoplasm. So we may say of chorionic epithelium: Physiologic and very rarely malignant in the female, accidental and invariably malignant in the male."

Callens (4) points out that the several theories of the genesis of chorio epithelioma of the testicle have been abandoned in favor of the belief that this tumor originates from a fetal rest of the primordial "gonoblasts" by a process of parthenogenesis.

Gerber (14) explains that 'Extragenital or ectopic chorio epitheliomas in males are considered to develop from germinal rests or as malignant transformations of teratomas. The germinal rests or teratomas are most commonly found in the mediastinum or in the retroperitoneal region along the course of the urogenital anlage. The concept of the origin of chorio-epitheliomas from mis-

placed testicular rests has recently received additional support in the findings of Staemmler who reported the occurrence of such rests in the retroperitoneal fat at the root of the mesenteric vessels. He believes that they represent rests of the *phica urogenitalis*. Inasmuch as the *phica urogenitalis* extends from the sixth thoracic to the second sacral segment in the embryo, the author believes that germinal rests also may be found in the mediastinum in the adult.

In discussing chorio-epithelioma of the testicle, Entwistle and Hepp (8) mention the theory of Delafield and Prudden. These neoplasms are described in the older textbooks under the name cystoma or adenoma but are now suspected by many to arise from dissociated blastomeres. A blastomere is one of the cells resulting from the first few divisions of the fertilized ovum. The earliest are totipotent, since any of them can produce all the tissues of the body. Hence they differ from their descendants, which become gradually multipotent or able to evolve many tissues though not all and finally unipotent or capable of building but one. Teratomata of the testis are believed to arise at a time when the blastomere is totipotent and these growths are therefore potentially tridermal, i.e. may contain derivatives of all three germinal layers. Now, since derivatives of all three layers are potentially present in a teratoma of the testis, the tumor like a normal embryo will tend to develop a chorion. Thus is explained the chorio-epithelioma of the testis, a malignant and rapidly metastasizing neoplasm similar to that found in the female.

Hamdi (16) does not think that chorio-epithelioma of the testis need always arise from special germ cells but may originate in rare instances from any epithelial or undifferentiated mesenchymal cell. Gough (15) is of the opinion that since chorio-epithelioma of the testis metastasizes through the lymphatic system, a fundamental difference in type of tumor is suggested even though the cellular elements and the biological reactions may be indistinguishable from those present in the chorio-epithelioma which is associated with pregnancy and hydatidiform mole in the female.

The primary testicular tumor in their case Friedlaender and Moses (13) report was a teratomatous growth consisting of a chorio-epithelioma, a seminoma, an epidermoid cyst and an epithelioma.

#### PRIMARY CHORIO EPITHELIOMA OF THE OVARY

Primary chorio-epithelioma of the ovary is of particular interest because of its rarity and be-

cause its exact origin is still unknown. In this study reports of only 5 cases were found about 15 are recorded in the entire literature.

Simard (31) reports 2 cases which showed unusual features, one in its structure and the other in its clinical manifestations. His first patient, a woman aged forty-two, gave a history of continuous uterine bleeding from June, 1929 to March 1930 at which time the hemorrhage ceased and she became aware of a mass in her abdomen. There had been no history of pregnancy in the five years previous to this. A diagnosis of pedunculated fibroma of the left horn of the uterus was made. When the patient was operated upon a tumor of the left ovary was found and a subtotal hysterectomy with bilateral salpingo-oophorectomy was performed. The ovarian tumor weighed 410 gm and measured 16 by 10 by 9 cm. The histological diagnosis was chorio-epithelioma. Two weeks after discharge from the hospital the patient was bedridden with shortness of breath, persistent cough, pallor and emaciation. A roentgenogram showed evidence of metastases in the lungs. The patient died two months after her operation. At autopsy it was observed that there were no evidences of recurrence or metastasis in the abdomen. The mucosa of the uterus and of the tubes showed no modification and the pulmonary metastases were of the same histological structure as the primary tumor. There was absolutely no doubt about the diagnosis of chorio-epithelioma. A portion of the pathological study of this case is as follows. One of the fragments is worthy of special mention. It is formed by ovarian stroma which is barely modified by the edema and is bordered by the invading chorio-epithelioma. Many vessels of small caliber reveal around their endothelial lining a thick sheath made up of several layers of cells. These cells are large and are round, oval or club-shaped. Each cell is sheathed by a delicate collagen lining. Their cytoplasm, which is transparent, clear and acidophilic, contains fine granulations stained blue by phosphotungstic haematoxylin and black by iron haematoxylin. The nucleus swollen and lacking in chromatin is oval and is located in the center of the protoplasm.

Simard assumes that decidual cells are formed from the connective tissue cells of the ovary, or that these perivascular cells have the same significance as decidual cells. The fact is worthy of mention because never to his knowledge have such elements been described in relation to a primary ovarian chorio-epithelioma. Interest is augmented by the fact that this is likely to

throw light on the causality of decidual cells. In normal pregnancy decidual reaction has been attributed to several hormones: estrin, folliculin, the placental hormone. In his case this last hormone seems to have played a part since the tumor was formed exclusively of a pure culture of chorio-placental elements. It would seem then that the decidual cells in the ovary, which have been described are attributable to the chorio epithelioma, and it would follow that the decidual cells in normal pregnancy are attributable to a chorio-placental hormone.

Simard's second patient was a virgin seventeen years old with a tumor in the right lower quadrant. She was operated upon, and a mass which was attached to the right ovary and which was about the size of a baby's head was removed. The pathological report was chorio-epithelioma. At this time both the urine and a specimen of the tumor gave a strongly positive Aschheim Zondek reaction. The patient made an uneventful recovery but died four months later. No details as to the circumstances of her death could be obtained, and no autopsy was performed.

A small group of primary ectopic chorionomas arise without any preceding pregnancy and are of teratomatous nature: their origin in the ovary being analogous to chorioma of the testis. Following this statement Preston and Gay (28) report such a case. Their patient was a married white female aged twenty-two years who complained of vaginal bleeding, pain in the lower abdomen, morning nausea and vomiting and slight tenderness of the breasts without appreciable enlargement. Examination showed the breasts to be well developed and the areolae pink. No secretion could be expressed from the nipples. In the posterior cul de sac there was a large, semi-soft, slightly tender mass, apparently connected with the right tube and ovary, and almost completely obstructing the rectum. The Friedman test was positive. After a preliminary transfusion of blood, the patient was operated upon, and the tumor with the attached right tube was removed with difficulty. The right ovary was not identified. Both the left tube and the left ovary were normal. The histological diagnosis was chorioma of the ovary. 'The Friedman test remained strongly positive. Three blood transfusions were given postoperatively but twenty-one days after the operation the patient died. At autopsy metastases were noted in the lungs, the spleen, the liver, the wall of the ileum, and the kidneys. The left ovary showed no evidence of corpus luteum.'

In the discussion of their case Preston and Gay say that differential diagnosis was confused with

ectopic pregnancy because of the history of morning nausea and vomiting and tender breasts which suggested pregnancy. They add that 'while a routine Friedman test is of no value in differentiating chorioma from hydatidiform mole or pregnancy, a persistently positive test after removal of all gross tumor is valuable evidence that removal was actually incomplete.' These authors conclude, 'The case reported here brings up the academic question as to whether the tumor arose from the placental remnants of a pregnancy two years previous or as a teratoid tumor from the ovary. In assuming the former, one must consider the possibility that the remains of a pregnancy within the uterus disappeared. An undestroyed placental fragment transported to the region of the ovary may then have become malignant. Another possibility is that an ectopic pregnancy either in the tube or ovary may have terminated in a similar manner, the passage of clots being the result of the loosening of endometrial decidua. It seems unlikely that a tubal pregnancy could have ruptured or aborted and leave the tubes with no evidence of damage. Although an interval of two years between pregnancy and the appearance of tumor is unusual, a latent period of several years does not argue against the relationship between the two. The disappearance of primary uterine chorionoma has been authentically reported (Novak and Koff) and may be applicable to the case reported here. The question as to whether the tumor was related to ovarian pregnancy or originated as a teratoma cannot be answered. The surgical specimen was subsequently reviewed in an effort to find teratomatous tissue other than chorionoma but without success. However, in the reported cases the chorionic elements of a teratoma had frequently so outgrown the other tissue that the latter were hard to find. It appears, therefore, that the case is one of primary chorionoma of the ovary.'

Schwarz and Freund (29) report the case of a twenty-six year old woman who died following removal of the uterus and adnexa for a primary chorio-epithelioma of the right ovary. A right nephrectomy for what was thought to be a hypernephroma, had been performed previously. His pathological study of the kidney tumor, which had been removed surgically, showed it to contain metastatic chorio-epithelioma. At autopsy wide spread metastases were observed in the lungs, the left kidney, the brain, and the eighth thoracic vertebra. In the left adrenal gland many of the arteries and veins of the cortex were filled with tumor thrombi. These thrombi showed no organization as yet and the infarcts appeared not to be

very old. In addition to these findings there was a macroscopic metastasis of chorio-epithelioma which was very hemorrhagic and showed extensive necrosis.

Teratomatous chorio epithelioma of the ovary belongs Fikentscher (10) says, to the rarities as far as the literature is concerned. In commenting on the histological structure of the tissue he states that in the tumors the chorio epitheliomatous portions are found in company with the most varied tissues and he mentions the fact that a tumor which Haffen examined showed the structure of a granulosa cell tumor in addition to the chorio epitheliomatous elements. Fikentscher states further that at times the chorio-epitheliomatous structure in malignant teratomas is not seen in the primary tumor but in the metastases. For the diagnosis of this condition he stresses the use of the biological pregnancy tests especially those for the quantitative estimation of the chorionic gonadotropic hormone. He warns however that there are different causes which may lead to the finding of either a normal or lessened hormone content stating that among these causes are early degeneration of the hormone active tissue, prevention of hormone secretion into the blood stream by fibrin barriers and variable and different functional ability of such chorionic diseases which may appear to be microscopically alike.

In this connection he cites the names of various authors—Ehrhardt, Philipp, Ruzicka, Hajek and Bareuther and Kawanobe. He also cites the work of A. Heim who noted marked elevation of the hormone content in the so-called toxicosis of pregnancy especially eclampsia and hyperemesis and he emphasizes the fact that false conclusions might be derived from single estimations of the chorionic gonadotropic hormone because the hormone content in the urine of the same person undergoes variations which correspond to the changing concentration of the urine.

Fikentscher's patient was a fourteen year old girl who underwent removal of a hist sized ovarian tumor. Histological examination showed a teratomatous chorio-epithelioma. Soon after the removal of the primary tumor metastases developed throughout the entire body and a short time later the patient died. During the time she was under treatment several quantitative estimations of the gonadotropic hormone in the urine were made according to Zondek's method. A positive test was procured with 0.003 ccm of urine a dilution corresponding to 00,000 mouse units per liter of urine. A positive Aschheim

Zondek test was also obtained following the implantation of pieces of metastatic tissue from the liver. Fikentscher thinks that many of the unsolved problems of chorio-epithelioma particularly of the site in which the gonadotropic hormone is formed may be solved through the study of teratomatous chorio-epithelioma. He adds however that from the findings in his case, in which the hormone was present in the tumor tissue itself he cannot decide whether the hormone is only stored in the tumor tissue or whether the tumor tissue actually produces the hormone. As an argument against the formation of chorionic gonadotropic hormone by the anterior lobe of the pituitary gland Fikentscher cites the work of Philipp who obtained positive Aschheim Zondek tests with the urine of young children who had chorio-epithelial tumors. This is especially important since it is known that the anterior lobe of the pituitary gland of such children does not contain a hormone which gives rise to the pregnancy reaction.

*Comment.* Primary chorio epithelioma of the ovary is so rare that its very existence is questioned and there is much disagreement as to its origin. All of the 5 patients in this study had extensive metastases. The symptoms in each instance were of long duration and their nature was not known. Most of the cases were misdiagnosed until after operation hence treatment was of no avail. All of the patients died. The difficulties of diagnosis are obvious and it appears that only by a lucky diagnostic stroke and early operation can any patient with primary chorio epithelioma of the ovary be cured. Every case encountered should be thoroughly reported.

#### PRIMARY CHORIO-EPITHELIOMA OF THE TESTICLE

For many years chorio-epithelioma of the female generative organs has been a recognized entity. That histologically identical growths are to be found in the male is a discovery of comparatively recent times (Kirwin 22). While not so rare as primary chorio-epithelioma of the ovary this type of growth in the male occurring primarily in the testicle, is seldom seen. In this study 31 cases were found including the 2 herein reported by Dr. Robertson and it appears that 200 would cover the total number of cases recorded so far in the entire literature. According to Kirwin (22) Ferguson at the Memorial Hospital in New York found 6 chorio-epitheliomas in a series of more than 400 cases of testicular tumor. In the last ten years Juengling (21) saw 2 chorio-epitheliomas in 21 cases of malignant testicular tumors. He states that Desjardins, Squire and Morton of the Mayo Clinic saw only 1 chorio-epithelioma in 101 malignant testicular tumors.

that Keller saw 2 in 30 malignant testicular tumors and that Mackenzie saw 1 in 13 cases. He further states that Heidrich, Fels, and Mathias estimated the number of cases published in the world literature to be about 140 up to 1930.

Most authors accept the hypothesis that chorio epithelioma testis represents the malignant growth of the chorionic tissue which is a part of teratomas. A few, however, have difficulty in accepting this theory. For example, Fortner and Owen (12) doubt whether males may have a structure with the morphological value of an included ovum which in turn may possess trophoblastic tissue. They cite Bostrom as believing that these tumors in the male might arise from undifferentiated germ cells (serotinal wandering cells), which, being affected by humoral influence proliferate to form primary tumor cells. These authors also state, Frank has regarded the formation of chorioneplitheliomatous tissue in the male merely as evidence of a metaplastic change in an embryonal ectodermic structure which, under certain unrecognized conditions is capable of producing this variety of tumor tissue just as in response to other stimuli these tissues may undergo carcinomatous changes. Fortner and Owen are of the opinion that it would be difficult to explain embryologically primary chorio-epithelioma above the diaphragm since this structure is said to arise from the fifth cervical segment, while the urogenital ridge is believed to arise from the sixth cervical segment.

Kirwin (22) is partial to the theory presented by Schlagenhauer in 1902, that chorio epithelioma of the testicle is genetically equivalent to the chorio-epithelioma seen in the female and is originated in a teratoma. Notwithstanding the fact that these assumptions have been assailed by Pick and Robert T. Frank, and more recently by French and American authors, Schlagenhauer's conclusions, Kirwin says, still stand. Kirwin cites the excellent summary of those oppositions which Rene Jeanneret made a few years ago: (1) One side claims that true fetal membranes have never been positively identified in a testicular teratoma. Yet we have known for a long time that elements of chorionic ectoderm are observed with relative frequency in mixed tumors of the testicle. (2) The question has been asked: If there are fetal membranes in teratomas, why do they not sometimes develop into benign growths such as hydatidiform moles, instead of regularly producing chorioneplithelioma, which is a malignant tumor? In reply to this it may be stated that at least five cases of hydatidiform moles in the male have been reported but none are suffi-

ciently well authenticated to offer conclusive proof.

To add to the argument, Bankoff (2) states that chorio epithelioma in males is usually localized in the testicles or in testicular teratomas, and that the extragenital localization is probably only apparent or at least extremely rare. He further states that the histological aspects of the chorio-epithelioma in males correspond morphologically with those of the chorio-epithelioma in women, and that in its behavior toward the general organism the chorio-epithelioma of males likewise resembles that of women. However he doubts whether this similarity is proof that these tumors are of the same type since it is known that tumors with the same histological aspects may be of different origin. In support of the hypothesis that chorio epitheliomas are of different nature in men and women the following characteristics are cited. The teratomatous chorio epithelioma occurs only in men and always in the testicles; the entire tumor is of a malignant nature and free from benign elements in contradistinction to the tumors in women, the metastases of the chorio epithelioma in men appear almost exclusively in the retroperitoneal lymph nodes; combinations of chorio-epithelioma with other types of testicular tumors as well as a direct transition of chorio epithelioma like structures into adenocarcinomatous proliferations are demonstrable only in men. The author arrives at the hypothesis that chorio-epithelioma originates like all other testicular tumors in the testicular parenchyma. Its anatomical structure proves to a certain extent that its syncytial cells originate from Sertoli's cells.

*Comment.* While the argument as to the identity of teratomatous chorio epithelioma is not settled, it would seem that a clincher in favor of the theory of chorionic origin is the fact that men who have such tumors excrete excessive amounts of the chorionic gonadotropic hormone and frequently show pregnancy changes such as excessive nausea and vomiting and gynecomastia.

Kirwin (22) quotes Jean Callens who in February 1935, said: "Chorio-epithelioma of the testicle that curious essentially feminine tumor of the male sex gland after having for a long time tested the sagacity of anatomical pathologists has now returned to the limelight since the perfecting of the various pregnancy reactions. Biology has now shown us, thanks to the discovery of the pregnancy reactions of Aschheim and Zondek, that we have to do with a true ovum composed of all its membranes. Could a more convincing proof of the reality of chorio-epithelioma be

brought forward than is done by these reactions, wherein its identity is verified by its own secretions? To deny the identity of the hormone would be to deny the existence of the evidence itself." In considering the questions which arise when the histogenesis of this entity is studied Kirwin concludes: "Answers to these questions have been diligently sought but the situation none the less remains very complex. There is hardly a subject in the realm of urology which is so hard to comprehend intelligently. The rarity of the growths and the difficulties of proper classification when found only make it the more important that we recognize chorio-epitheliomata when we encounter them."

Dickson (6) offers a very interesting discussion relative to the genesis of these tumors when he says: "For years there has existed a belief that malignant neoplasia is analogous to the growth of embryonic tissue. It has not been stressed however that we have in chorio-epithelioma a well known tumor which is actually composed of embryonic tissue from one individual growing in the body of another. Normal chorionic epithelium has properties which in any other situation would signify malignancy. It invades the wall of the uterus, erodes its blood vessels and at times forms emboli in the maternal blood stream. These features support the embryonic theory of tumor genesis. They have been well described elsewhere."

Normal chorionic syncytium and cancer cells have much in common: extraordinary reproductive energy, rapidity of growth, invasive power coupled with destruction of the recipient tissue and striking facility for hematogenous dissemination. When chorionic syncytial giant cells lodge in the lung as they do with every childbirth they soon die; but when carcinoma cell emboli lodge in the lung they survive and grow only too frequently. One succumbs apparently to an anti-syncytial hormone against the other no such defensive mechanism seems to be at hand.

**Mediastinal tumors.** In a few reported cases teratomatous elements were found in a primary mediastinal tumor. While some of these are doubtful and while they are rare, those in question gave no evidence that the tumor had arisen from the genital tract. There might be two explanations for the presence of a primary growth in the mediastinum: the one that there really had been a primary growth in the testicle which through necrosis became obliterated; the other the concept of Staemmler quoted by Gerber (14) that these primary mediastinal growths might take place from misplaced testicular rests of the plica urogenitalis (genital ridge) which extends from

the sixth thoracic to the second sacral segment in the embryo. (There is a difference of opinion among embryologists as to the relationship of the origin of the diaphragm and the genital ridge. Some believe however that genital rests at times migrate upward and above the diaphragm from the cloacal region.)

**Pathology.** Very little has been written on the pathology of chorio-epithelioma in the male. A few papers such as that of MacDonald (24) concerning chorio-epithelioma of the choroid, refer to specialized pathology. MacDonald reports as follows the microscopic examination of the autopsy material which presented the characteristics of typical chorio-epithelioma. Large necrotic and hemorrhagic areas were present surrounded by a rim of living tumor tissue. The cells were of two types: polyhedral cells with a vesicular nucleus which tended to grow in sheets and cords, and syncytial masses of protoplasm having several large dark staining nuclei. These masses of syncytial cells tended to outline spaces containing red blood cells and showed marked invasive qualities. Sections from the breast showed hypertrophy of the glands, the acini containing a pinkish staining hyaline secretion. Fortner and Owen (12) who had 2 cases comment that: "Sections from the primary tumors and metastatic nodules in both these cases disclosed typical characteristics of chorionepithelioma. In addition to the syncytial masses dipping into large areas filled with red blood cells some strands appeared to have central connective tissue cores with capillaries thus resembling chorionic villi. In discussing his case, Gerber (14) says: "The tumor had no distinct capsule. It was cellular and had extensive areas of hemorrhage and necrosis. The tumor cells consisted of two distinct types. One type resembled the Langhans cells of normal placental tissue. The cells were large polyhedral in shape and were grouped in broad nests or plaques. Their cytoplasm was basophilic, abundant and vacuolated; their nuclei were large. Occasional mitoses were present. The other type of cells found along the margins of the broad cell nests resembled the syncytial wandering cells of pregnancy. They were large, irregular, often angulated and possessed an abundant acidophilic cytoplasm with multiple large hyperchromatic nuclei. Mitoses were also seen frequently. No cilia were present in these cells. Careful search of the tumor sections revealed no teratomatous elements. The metastatic nodules in the lungs, liver, spleen and kidneys presented a similar histologic appearance. In their case Craver and Stewart (5)

state that histologically the main tumor, which was in the thorax, proved to be a classical choriocarcinoma, as were the metastases. "Both testes were completely atrophic. Very rare degenerated nonfunctional testicular tubules were found in the midst of a generalized bilateral diffuse overgrowth of large interstitial cells. The two distinct nodules described in the left testis were of great interest. The upper one consisted of a cyst lined by sloughing stratified squamous epithelium as in a cholesteatoma. The very small mucoid area proved to be an adult looking branching mucous gland with fully developed ducts. No evidence of other teratoid structure was found."

**Pituitary gland.** The histological examination of the pituitary gland in chorio epithelioma should be of considerable interest. In this survey there are several reports in which such examinations are mentioned. For example, Juengling (21) states that in the hypophysis of one of his patients signs of pregnancy were noted. Sections of the pituitary gland from Entwisle and Hepp's (8) patient showed a large preponderance of chromophobe cells, hyperplasia of basophils and a few eosinophils. They explain that the swollen chromophobe cells are called cells of pregnancy. In his report, Herlant (17) makes the note that the hypophysis had assumed the character associated with normal pregnancy. MacDonald (24) records the finding of marked changes in the pituitary gland of his patient. "The pituitary body of their patient." Friedlaender and Moses (13) relate, showed the typical changes which are a result of pregnancy, namely a distinct increase of mother cells, a reduction of the eosinophils, and a great increase in the basophilic elements. On the other hand, Craver and Stewart (5) state that grossly and microscopically the pituitary gland was normal in their patient.

**Metastases.** In most of the cases reported, metastases were already present when the patient came for treatment. This, no doubt, was due to the fact that the disease had reached a certain stage of advancement, and thus probably accounts for the terrific death rate. Lung metastases are the most common and their presence is a very grave prognostic sign. Juengling (21) says that the early presence of extensive coin shaped pulmonary metastases is a point against the diagnosis of seminoma and one in favor of chorio-epithelioma. In contrast to chorio-epithelioma in the female, the course of this condition in the male is usually stormy and fulminating and there is early metastasis to the lungs. He contrasts seminomas with chorio-epitheliomas with regard to their characteristics and the success in

their treatment. Craver and Stewart (5) describe a case of chorio-epitheliomatous metastases from a small tumor of the testis which had undergone complete local healing by sclerosis, and they state that this once more raises questions of interpretation in reports of extragenital choriocarcinoma. Both lungs in his patient, Gerber (14) says, were studded with tumor nodules, and nodules were also present in the liver, the kidneys, and the spleen. No gross connection, however, could be found between the tumor and any part of the genital tract. Among other metastases, a large detachment caused by a mass that was solid in appearance was seen in the upper and outer part of the retina in the right eye of his patient, MacDonald (24) reports. This case was one of chorio-epithelioma of the choroid.

**Symptoms and diagnosis.** The paucity of cases reported makes it difficult to elaborate on symptoms and diagnosis. Many of the patients were seen first with lung symptoms, such as dyspnea and pain in the chest (5, 21), and hemoptysis (15, 21, 24, 38). Some patients had pelvic or abdominal tumors (14, 32). In one instance fatigue was an outstanding symptom, and one patient had epigastric pain (32). In some cases the diagnosis was made with roentgen rays. For example, Craver and Stewart (5) and Gerber (14) report the finding of a large mediastinal mass by means of the roentgen rays, while Fortner and Owen (12) record the finding of metastases in both lungs in this manner. Kirwin (27) states he noted marked enlargement of the bronchial and cervical lymph nodes by means of the roentgen rays.

**Gynecomastia and pregnancy symptoms.** Among the outstanding and very interesting changes observed in men harboring chorio-epithelioma is gynecomastia. Symptoms which might be associated with pregnancy are also noted in these patients. For example, MacDonald (24) reports the observation of enlargement of the breasts, female distribution of pubic hair, and linea nigra in his patient. In the report of their case, Entwisle and Hepp (8) write, "Both breasts were enlarged and tender, were slightly red and a few drops of colostrum could be expressed from each side." Fortner and Owen (12) report that one of their patients had prominent, firm and disc shaped nipple regions, measuring about 5 cm in diameter, and the other patient had slightly enlarged breasts. They report further, "Sections through the mammary glands presented an increase in the number of acini, with an increased amount of fibrous tissue between them. The acini were moderately dilated and displayed evi-

dence of activity. Kirwin (22) calls attention to the breast changes which were emphasized for the first time by Cooke in 1915 and which had already been noted by Warthin and Garbarini. He mentions the fact that Cooke's patient as well as the 2 other patients had noticeable enlargement of the breasts and secretion of colostrum like fluid. These mammary evidences, Kirwin explains, gave strong confirmatory support to the unsettled question of the relation of these tumors to the chorio-epithelioma of the uterus long familiar to pathologists. He adds further that in Warthin's patient the hyperplasia of the breast decreased after the removal of the tumor from the testicle. Kirwin also cites Ross who speaks of enlargement of the breasts as a late manifestation. Melot (5) quotes Laetsch and Arendt as having observed gynecomastia and even secretion of the colostrum type in male carriers of chorio-epithelioma. Truc (36) reports the case of a patient who had such a tumor and showed breast changes. Dickson (16) mentions gynecomastia at times with secretion of colostrum as one of the symptoms. Callens (4) and Videla, Vivoli and Rey (35) also report the presence of gynecomastia in their patients. In fact Callens believes that the association of gynecomastia with a testicular tumor and a pregnancy reaction in the urine will make the diagnosis of chorio-epithelioma unquestionable. Truc and Guibert (37) say that in their patient the gynecomastic syndrome did not disappear after castration which indicated the gravity of the prognosis. Juengling (21) speaks of gynecomastia as a prominent symptom and reports that one of his patients had fibromatosis of both breasts and that the breast gland of the other patient was in a stage of tubular overdevelopment with an increase of the stroma. One of his patients also had uncontrollable vomiting. Friedlaender and Moses (13) state that the breasts of their patient showed distinctly abnormal development with colostrum like secretion. As a further pregnancy sign these authors mention the fact that their patient suffered from almost uncontrollable vomiting analogous to hyperemesis which they attribute to the flooding of the body with gonadotropic hormone. Upon histological examination they found that the glands of the nipples were enlarged and showed extensive budding. Brews (3) reports nausea and vomiting.

Entwistle and Hepp (8), Brews (3) and Gerber (14) report that their patients gave a history of injury to the testicle. Several authors however including Fortner and Owen (12) refer to the painless character of the testicular growth.

**Testicular growths.** By far the majority of patients has a growth in the testicle. Sometimes the growth causes considerable enlargement of the testicle at times it is not observed on a casual examination because it is so small, and is found only after a thorough search or after section of the testicle. Juengling (21) emphasizes the fact that the primary growth in the testicle can be very small, and hence make the diagnosis difficult. Ogilvie and Mackenzie (26) contend that the nodule in the testis may be so small as to cause no apparent enlargement. Smith (32) states that the growth his patient had was the size of a small pea and was located at the lower pole of the right testicle. In their case Entwistle and Hepp (8) report. There was a very small hard nontender nodule in the upper pole of the left testicle which was about half the size of a lima bean. It was quite difficult to tell whether this was actually in the testicle or whether it was an indurated portion of the epididymis. Craver and Stewart (5) say that the tumorous growth in the testis of their patient was not located until an autopsy was performed. They add. Both testes were small, very firm and atrophic. No tubules could be seen. The seminal vesicles were atrophic, the prostate was normal. The right testis was of homogeneous color and consistency throughout. In the left testis similar in all other respects to the right were two small nodules. The upper of the two situated near the rete was a small whitish cyst 3 mm in diameter. The lower, about 1 cm removed from the former, appeared like a small focus of mucinous tissue not more than a millimeter in diameter. After hardening the entire testis was cut in serial slices with a razor and nothing else suggestive of a primary tumor could be found. Search was made for pin point hemorrhagic areas or foci of pigment but without avail. These authors state further. One is therefore probably justified in assuming that in the early stage of the teratoma a choriocarcinomatous portion reached the systemic circulation with fatal results whereas any residue in the testis disappeared probably through hemorrhagic necrosis. The remainder of the primary tumor remained quiescent in the form of a small cholesteatomatous cyst and a minute area of adult mucous glands. Kirwin (22) reports that his patient had a mass in the right side of the scrotum. There was no pain. Upon examination the distended scrotum transmitted light but in a manner so peculiar that to the diagnosis of hydrocele was added the possibility of neoplasm. In one of his cases Brews (3) speaks of swelling of the right testicle and in his other case he mentions the fact that at



autopsy a small teratoma was found in the center of the right testis. In his report, MacDonald (24) states, "The left testicle was enlarged to the size of an orange. It was smooth and soft and did not fluctuate, it was painless on pressure, did not transmit light and was unattached to the surrounding structures. Jalet (19) says that the left testicle of his patient was hard and enlarged. Truc and Guibert (37) write that the left testicle of their patient, was enlarged but not painful. Fortner and Owen (12) make the following note in 1 case: "Examination revealed a tense enlargement of the scrotum with a hydrocele on the right. Large tortuous veins were present, some the size of an ordinary lead pencil. The left testicle was palpable, but no structures were outlined on the right until about 350 c.c. of amber colored fluid were removed, when all the structures were found to be involved in a hard, nodular mass of tumor tissue." In their second case they make the note, "the left scrotal sac contained a tumor mass about  $10 \times 8 \times 6$  cm."

In other cases it is reported that the tumor did not appear to be in the testicle but either in the abdomen or in the mediastinum. Such a case is reported by Jaquenod (20). Her patient had a retroperitoneal tumor the size of a child's head, which she thinks developed from a teratoma situated in front of the aorta. Ogilvie and MacKenzie (26) describe a retroperitoneal growth with many metastases. Symeonidis (35) reports a case of retroperitoneal tumor which proved to be a chorio epithelioma. He states that he found a small amount of atrophic, completely developed testicular tumor at the periphery of the abdominal growth, and he assumes that the lesion was due to a teratoma of an accessory, abnormally retained testis with predominance of chorio epitheliomatous elements. Gerher (14) says that in his patient, "A firm, slightly tender, irregular mass about the size of an orange was palpated in the right lower quadrant of the abdomen just above Poupart's ligament. The genitalia were negative. In 1 case, Brews (3) reports "many lumps" could be palpated in the abdomen. Levi Valensi, Montpellier, Debré, and Bartholi (23) state that they made the diagnosis in their case from a biopsy of a subclavicular nodule.

**Biological pregnancy tests.** The fact that these tumors in the male produce enormous quantities of chorionic gonadotropic hormone, which is found in all tissues of the body (in the urine, in the blood, in the spinal fluid, and even in the contents of cysts), has practically "upset the apple cart" of those who do not believe in the chorionic origin theory of these tumors. As wit-

nessed by most authors, not only is the biological pregnancy test positive in cases of these tumors, but an enormous quantity of the chorionic gonadotropic hormone appears to be excreted. Practically all authors have used the pregnancy test in its qualitative phase as a diagnostic aid, and many have used it quantitatively, not only by means of the Aschheim Zondek method but also by the Brindeau Hinglais method with the rabbit.

Zondek (39) remarks as follows: "Also in chorioepithelioma of men, assay for gonadotropic substance is of importance, particularly in mixed testicular tumors. In a lecture at the Viennese Biologic Society (April 15, 1929) I pointed out, with reference to the strongly increased excretion of gonadotropic principle in the chorioepithelioma of women: 'It will be very interesting to examine the urine of men suffering from a chorioepithelioma, in order to determine the biologic identity of these epitheliomas.' Some weeks later (May 1929) I was in a position to examine a case of malignant testicular tumor, a greatly increased excretion of the hormone was detected (both follicle stimulating and luteinizing factors). This was a mixed tumor with chorioepitheliomatous elements. The biologic identity of these epitheliomas in men and women is now established. By assay of the tumor material (implantation or, still better, extraction) evidence may be derived as to the nature of the tumor. Thus I did not find any gonadotropic substance in the tumor tissue in a dysgerminoma, but it was present in the chorioepitheliomatous areas in large quantities. One can also get some idea of the malignancy of a particular tumor by means of these assay methods: hormonal tissue diagnosis and hormonal urine analysis. The latter seems to me to be confirmed by the investigations of Ferguson. I am, however, skeptical whether the anatomic structure of a tumor can be ascertained by the hormone excretion as accurately as Ferguson appears to believe."

Fluhmann (11) writes: "The presence of a gonadotropic principle in the urine of men with teratomas of the testicle was first reported by Zondek and has received abundant confirmation from Ferguson and others. It also has been recently shown that this substance has the biologic properties of the chorionic and not of the anterior hypophyseal hormone (Fluhmann and Hoffmann, Evans). The test in such cases is of value in the differential diagnosis of testicular tumors and may be employed to determine the effectiveness of operative or irradiation therapy and the appearance of metastases following the eradication of the primary tumor. In a recent communication,

Hamburger maintains that in addition to the group of new growths which produce the chorionic hormone seminomas of the testis may also cause the appearance of a gonadotropic factor which has the characteristics of the anterior lobe follicle stimulating hormone.

Juengling (21) emphasizes the use of the biological pregnancy tests. He knows of no negative Aschheim Zondek reaction in the presence of chorio-epithelioma. Callens (4) says the Aschheim Zondek test is of value in establishing the diagnosis and in making a prognosis. Ehrhardt (7) feels it is a serious omission to neglect urinary assay for the gonadotropic hormone in a man with symptoms pointing to the testis. A persistently negative reaction after the extirpation of such a tumor is a good augury, whereas the return of a positive reaction is a sure sign of recurrence. Kirwin (2) quotes Ferguson as having recently stated in a personal communication. The differentiation of the chorionepithelioma from the remaining malignant tumors of the testes by means of assay of the urine for prolan is clear cut. No other tumor causes the excretion of the large amount as in the chorionepithelioma. In no true case has the excretion been less than 100,000 units per liter of urine. Gerber (14) reports a positive Aschheim Zondek reaction in high dilutions of urine which was obtained at autopsy. Friedlaender and Moses (13) are of the opinion that in all cases of questionable testicular tumor it is advisable to do an Aschheim Zondek test. Fortner and Owen (12) say that normal male urine contains less than 50 mouse units of prolan per liter. It is apparent that the increased amount of the hormone from 10,000 to 150,000 mouse units per liter offers an index of diagnostic value. Truc and Guibert (37) report that they made a quantitative analysis (Brouha-Hinglais method using the rabbit) and got a positive reaction with a single injection of 15 c cm of urine. They add that they also obtained a positive gonadotropic hormone reaction with the fluid from the hydrocele which was associated with the chorio epithelioma of the testicle in their patient. Smith (32) was so impressed by his success with the Aschheim Zondek test in the diagnosis of pregnancy and tumors of chorionic origin that he thinks it should be used more frequently in medical diagnosis. His 2 patients came under his observation for complaints which indicated ordinary medical illnesses, and it was not until the Aschheim Zondek tests were found to be positive that the true nature of the illnesses was elucidated. He strongly advises the use of the Aschheim Zondek test in all special examinations of the testicles and in examinations

of all males showing retroperitoneal glandular enlargement.

Lwald (9) states that he obtained a positive Aschheim Zondek reaction with 2.5 c cm of cerebrospinal fluid from a man with chorioepithelioma. He thinks that his method might enrich our diagnostic acumen. Smith and Smith (34) mention the cases of 3 men who had chorio-epithelioma. They found a very high concentration of the hormone like that found in the anterior pituitary lobe in the blood and urine of these patients and an estrin content so low that it was not demonstrable without concentration of the specimens by extraction. Their data indicate that the chorionic cells themselves when they become neoplastic do not contain oestrin in amounts comparable with those in the normal placenta.

**Treatment.** Treatment of chorio-epithelioma in the male seems almost as hopeless as that of teratomatous chorio-epithelioma in the female. Fortner and Owen (12) think that since these tumors consist of anaplastic and undifferentiated tissue they may be expected to be highly radiosensitive and once a diagnosis has been made pre-operative irradiation may be followed by radical removal of the primary site. For metastatic areas they feel irradiation is at present the method of choice. Juengling (21) is skeptical about roentgen ray treatment. He says that as far as he knows only 1 case has been treated successfully with roentgen rays. In his cases the growths were completely refractory to roentgen rays. He believes that some of the reported cures by this treatment were in cases of seminoma and not chorio-epithelioma because seminomas are known for their radiosensitivity and radiorefractory seminomas are undoubtedly rare. Entwistle and Hepp (8) report that they removed the testicle of their patient under local anesthesia and applied high voltage roentgen therapy to the known involved areas none of which changed in appearance or size. Kirwin (22) states that he performed an orchidectomy on his patient and after the pathologist reported malignancy applied deep roentgen therapy to the scrotum on the site of the growth. Truc and Guibert (37) say that they did an orchidectomy under local anesthesia on their patient. In questionable cases Callens (4) suggests biopsy followed by immediate orchidectomy if the lesion proves malignant, but he feels that in spite of operative treatment the prognosis is usually hopeless. Several authors—Symeonidis (35), Smith (32), Jaquenod (20)—state that they performed exploratory operations made a diagnosis and closed the abdomen because the condition was inoperable. MacDonald

(24) reports that he enucleated an eye of his patient to relieve pain caused by a metastatic growth, and then treated the patient with roentgen rays. In an attempt at palliation, Craver and Stewart (5) say that they applied high voltage roentgen therapy for lesions of the lungs which their patient had. The patient, however, died. On the other hand, Gerber (14), Videla, Vivoli and Rev (38), Friedlaender and Moses (13), and Brews (3), in 2 instances, report that death of their patients was caused by cachexia and that diagnosis was made at autopsy. No roentgen therapy was used or operation done in these cases. In several papers and abstracts which were studied relative to chorio epithelioma of the testis, no mention was made of treatment.

In this study reports of only 2 cures of chorio epithelioma in the male were found. One case was reported by Bankoff (2) and the other by Smith (33).

**Lytic substance.** Juengling (21) discourses considerably on the difference between the effects of chorio-epithelioma in the female and in the male. He thinks that metastases in the female are less important than those in the male because of a difference in biological attitude. This difference in biological attitude between the male and the female he contends is comprehensible if one realizes that chorionic villi grow physiologically into the blood vascular system during every pregnancy. It is highly probable that some of these chorionic villi are frequently torn off, carried elsewhere, and, in the female, destroyed by the body. The various possible phases from the hydatid form mole to relative benignancy indicate the resistance of the female organism against this 'germ' which is relatively characteristic of this sex. On the other hand, Juengling continues chorio-epitheliomatous tissue is something definitely foreign to the male organisms, and one gets the impression from observations in the literature that the male organism is completely defenseless against the dissemination of chorionic tissue by way of the blood stream. He thinks that therapeutic measures are unsuccessful because the support by the defense mechanism of the body is lacking.

There is, however, a suggestion in the literature that some lytic substance might possibly be evolved as a cure. Sensing the possibility, and hoping that the ultimate treatment of chorio-epithelioma will be by means of a lytic substance, obtained probably from the post partum woman, Fortner and Owen (12) postulate, 'The trophoblast is known to be normally an invasive type of tissue and chorionic cells are reputed to possess the property of digesting the maternal tissue. The

embedding of the ovum is thought to be accomplished by the aid of this characteristic. The cells of the trophoblast are naturally endowed with great capacity for growth. Schmorl has reported trophoblastic emboli in 80 per cent of women during normal pregnancies. This parasitic tissue then is able physiologically to invade and wander. Blair Bell offers the opinion that chorionic epithelium, more particularly the syncytium is originally of a malignant nature, although after a few weeks it comes naturally under the influence of the developing fetus and its growth is arrested at a stage where it becomes subservient to the dependent embryo. Support for this theory exists in the work of Fraenkel who demonstrated that the serum of normal pregnant women is lytic to chorionic epithelium while the serum of women with chorionepithelioma lacks this property. There is a possibility that treatment of these tumors may eventually be non surgical, consisting in serum injections or endocrine therapy. In view of the observations made by Fraenkel it would seem that serum from pregnant animals holds promise of being beneficial. Such sera are now being utilized but it is too early to expect accurate findings. The very infrequency of chorion epithelioma testis will delay for some time an adequate report on this method of therapy, although results in chorionepithelioma in the female should be reported at an early date. Due to the close association of teratoma testis with chorion epithelioma as evidenced by their endocrine relationship, it might be expected that the lytic agents occurring in pregnancy sera would also affect the teratomas.

Dickson (6) in a most interesting paper suggests that serum from the female in the puerperium be given a therapeutic trial in the treatment of chorio epithelioma. 'The conception that chorionic epithelium per se is malignant seems reasonable,' he argues. 'It is not unreasonable to postulate that, having been exposed normally through the ages to the possibility of malignant growth of chorionic epithelium woman possesses an inherent capacity to combat such a development that given the presence of this epithelium, the absence or occurrence of malignancy is determined solely by the presence or absence of a capacity for defense by the host.' He points out 'The idea of a hormone or antibody control of normal chorionic epithelium is not new,' and he quotes MacCallum as saying that the complete disappearance of definite chorionic epitheliomas led Fleischmann (1905) to speculate as to 'Whether there is some substance formed in the maternal blood at the end of preg-



Fig. 1. Photograph taken at autopsy showing macular mild gynecomastia and filling in of jugular notch by diffuse colloid goiter.

nancy which like the experimentally produced syncytiotrophoblastic Scholten and Veit has the function of destroying the syncytial elements which remain buried in the uterine wall or lodge in distant organs. The failure of this substance might allow the unchecked development of the tissue into a destructive tumor while its late formation might account for the disappearance of the tumor. Dickson adds Kaufmann states that in pregnancy normal deported cells and villi are destroyed probably by cytotoxins in the sense of Ehrlich and that it is believed that when such antibodies are wanting the circumstances favor a rapid overgrowth or the formation of a malignant chorion epithelioma. He quotes Schmauch as believing that successful therapy of this tumor may be practiced by immunization against its specific cells. Dickson maintains. If the conception of a maternal hormone or antibody control of chorionic epithelium is correct serum from

the female in the puerperium and possibly also in the latter part of pregnancy when administered to one suffering with chorio-epithelioma might exert a retarding influence on the process. He recommends that selected patients with hopeless chorio-epithelioma be treated by the intravenous administration of large doses of serum from the human female taken at various stages of the puerperium. If the reaction should be favorable he would advise the use of serum from one of the lower animals such as the mare.

#### CASE REPORTS

CASE 1. W. H., a white male aged twenty seven was admitted to St. Vincent's Hospital on May 29, 1933 under the care of Dr. John R. Hand. His chief complaints were pain in the epigastrum of three months duration and nausea and vomiting of 10 weeks duration.

The patient had been in good health up to six months previous to admission at which time he lost sensation in his upper lip. Three months prior to admission he de-



Fig. 3. Case 1. Photograph taken at autopsy illustrating the retroperitoneal mass presenting between the pancreas and the lesser curvature of the stomach and elevating the pylorus and the duodenum to and the anterior abdominal wall.

veloped intermittent cramp like pains in the small of his back. The pain persisted and two weeks later he had an appendectomy. During this time he experienced no nausea or vomiting. From the onset of the pain until after the appendectomy he lost 25 lb in weight. Following the operation the pains became more severe and he developed epistaxis and hemoptysis. During this time he continued to lose weight gradually. Two weeks before admission to the hospital he began to have nausea and vomiting. The upper abdomen became distended but was relieved by the passage of flatus. The last four to five days before admission he was troubled with dizziness. There was a little urgency but no dysuria or hematuria. Some constipation was present. The stools however showed no gross blood.

Physical examination revealed a very emaciated white male, weighing approximately 100 lb (normal weight was stated to be 150 lb). The blood pressure was 120 systolic, 80 diastolic. A slightly yellowish tint to the sclerae and blood-tinged sputum in the nasopharynx were noted. There were palpable lymph nodes in the left supraclavicular region. The heart and lungs were normal. The abdomen was very resistant to palpation. Tenderness however was elicited in the upper part of the abdomen especially in the epigastric region. A small nodular mass about the size of a walnut was palpated on the left side of the abdomen just



Fig 4. Case 1. Symmetrical distribution of the cellular and the hemorrhagic nodules along the course of the aorta and the iliac vessels.



Fig 5. Case 1. Malignant cells of the syncytial and the Langhans type lining a vascular sinusoid.

below the costal margin. An appendectomy scar was noted.

On admission to the hospital the urinalysis showed 1 plus albumin. The blood count on the following day was normal except for an icteric index of 12.5. Sedimentation rate was 15 mm in fifteen minutes and 65 mm in forty-five minutes. The Kolmer and Kahn reactions of the blood were negative.

X-ray examination on May 31, 1933, revealed the following:

**Kidneys:** The outline of the kidneys was not visible, being obscured by a dense shadow which appeared to rise medial to the liver. The shadow could not be separated from the liver.

**Chest:** There was a metastatic carcinoma nodule in the upper lobe of the right lung. Another large nodule occupied the left hilus area and extended into the mediastinum.

**Stomach:** The stomach was displaced toward the left side by a large tumor mass and was dilated. There was a duodenal ileus involving the second portion of the duodenum with a delayed emptying time of the stomach and duodenum.

**Colon:** The colon was markedly dilated and of the relaxed type.

The patient complained of considerable pain in the abdomen requiring opiates for relief. He was nauseated and vomited on various occasions. He became progressively weaker and expired the third day after entrance. The

pulse rate temperature and respirations were irregular but did not vary greatly from the normal

Autopsy showed the following

**Gross examination** The patient was markedly emaciated white male twenty seven years of age Various sized small nodules were palpated in the superficial and deeper subcutaneous tissue of the left supraclavicular region The largest of these was about the size of a cherry The external genitalia were unchanged Nothing abnormal was palpated in the scrotum Mild gynecomastia was noted

A few cubic centimeters of clear straw colored fluid were present in the peritoneal cavity A large bulging retroperitoneal mass displaced the pancreas anteriorly and the otherwise unchanged common bile duct coursed over it to the usual opening in the duodenum This mass elevated the pylorus to the anterior abdominal wall at the edge of the liver The mass bulged above the lesser curvature of the stomach and displaced the latter inferiorly to the left The proximal portion of the duodenum was displaced anteriorly by the mass The pancreas could be entirely separated from the retroperitoneal mass and over the latter it was a thin compressed structure The transverse colon at its midpoint reached the symphysis pubis and the stomach extended below the umbilicus The prostate gland and seminal vesicles were grossly unaltered The kidneys were lateral and slightly posterior to the large central extraperitoneal mass and were readily freed from it The cut surfaces were bloody The renal vessels were smudged compressed and displaced superiorly by the tumor mass Smaller secondary nodules about the renal vessels compressed them moderately The adrenal glands were unchanged The retroperitoneal mass was seen to be at the center of the abdomen located anteriorly and lateral to the aorta which it compressed and upon which it encroached It also impinged upon the inferior vena cava with a bulging area pressing on the left aspect narrowing the lumen just below the renal veins In this region the mass measured approximately 13.0 by 8.0 cm in the transverse and anteroposterior diameters Sectioning showed what appeared to be one large central encapsulated mass and several adjacent large nodular areas The cut surfaces presented a mottled red to yellow to pinkish gray appearance with friable tissue that was pulp like in places Delicate whitish fibrous capsules surrounded the peripheral nodules of various sizes This appearance was characteristic of all the abdominal tumor nodules as well as of those found in the mediastinum and the left supraclavicular region All the mesenteric lymph nodes were enlarged to about three times their normal size and had the appearance of lymphoid tissue

Multiple large nodules were located in the superior mediastinum One nodule was found in the upper lobe of the right lung The thyroid gland was diffusely and symmetrically enlarged An encapsulated adenomatous nodule was encountered in each lobe but these nodules showed nothing suggestive of malignancy

After fixation each epididymis and the testicles were sectioned at very close intervals No tumor nodules scars or other gross abnormalities were encountered

**Microscopic examination** The abdominal nodules showed large areas of coagulation necrosis Large blood filled sinusoidal spaces like the sinusoids seen in placental tissue were separated by connective tissue trabeculae composed of well differentiated fibrous tissue In these trabeculae however there were other cells of an epithelial nature which occurred singly and in clusters in no orderly manner Among these were large syncytial multinucleated cells with hyperchromatic nuclei of various sizes Some had a distinct acidophilic cytoplasm In addition to these syncytial cells polyhedral shaped cells and round cells were present in

clusters These had a paler pinkish blue staining fibrillar cytoplasm and very large hyperchromatic nuclei of various sizes and shapes Many of these nuclei contained well defined nucleoli The syncytial cells were seen to be forming the immediate lining for many of the larger blood sinusoids and in places the other cells as described were found in these sinusoidal walls reaching the inner surface

Sections of all the other tumor nodules except those about the abdomen and aorta were composed entirely of the second type of tumor cells which in every respect simulated the malignant Langhans cell of a chorioepithelioma The cells filled the lymphatic channels and sinusoids and replaced much of the lymphoid tissue There were numerous blood filled spaces lined by the cells Here there were also a variable number of syncytial cells with hyperchromatic nuclei but the cells were composed mainly of the Langhans cells where the latter appeared to be forming chorionic villus like structures Only a few of the papillary epithelial extensions contained capillary blood vessels and for the most part the vascularity appeared to be supplied by the tissue unaided by proliferation of connective tissue and new blood vessels within the tumor nodules

**Lungs** The tumor nodules in the lung were seen only in hilar lymph nodes where the tumor cells occupied and distended lymph spaces

**Testes** None of the tumor cells described above was found Spermatogenesis was active and hyperplasia of the interstitial cells of Leydig was not

**Prostate** Glandular hyperplasia

**Thyroid gland** Colloid goiter

Other tissues showed no essential changes

**CASE 2** W. M. a white male aged twenty entered St Vincent's Hospital on October 23 1935 under the care of Dr Walter Keely with the following complaints (1) weakness and fever at one month's duration and (2) cough of three weeks duration

For three months prior to admission the patient had noticed a painless swelling in the right side of the abdomen at the level of the umbilicus Two months prior to admission he was operated upon for a twin tumor of the right testicle He had been aware of a low progressive pain in this testicle Four weeks following the operation he began to feel weaker and began to have a dry cough The cough rapidly became productive and by the end of another week the sputum was blood streaked at all times

The patient had first entered the Multnomah County Hospital here a positive Friedman reaction (4 plus) was obtained An x-ray plate of the chest showed extensive pulmonary metastases

A pathological diagnosis of testicular seminoma had previously been made on the testicle removed surgically Re-examination showed marked necrosis with areas of embryonal adenocarcinoma and round cell carcinoma appearance Nothing having the chorioepitheliomatous appearance of the metastatic lesion as found at subsequent autopsy was encountered

Physical examination revealed a thin nervous white male The skin was warm and moist The cheeks were flushed and there was marked wasting The temperature was 100.8 pulse rate 124 respirations 26 and blood pressure 122 systolic 84 diastolic Expansion of the chest was limited but equal There was flatness and bronchial breathings with increased transmission of vocal fremitus above the third rib posteriorly on both sides Numerous rales to moist rales were heard throughout the chest The sputum was frothy and grossly bloody The breasts were feminine in type Examination of the abdomen showed the pubic hair to have a feminine distribution There was a firm nontender mass in the right side of the abdomen at the level of the umbilicus This was well demarcated fixed but

apparently not attached to any surrounding organs. It was dull to percussion and did not move with respiration. The left testicle was not present and the right was atrophic.

Urinalysis revealed 2 plus albumin and a few hyaline casts and pus cells. Blood count showed hemoglobin 7.45 gm per 100 c cm, red blood cells 3,020,000, white blood cells 15,850, polymorphonuclears 90 per cent. The Kolmer and Kahn reactions of the blood were negative.

Treatment was symptomatic, an attempt being made to relieve the restlessness and cough and to combat the anemia. The patient's course was progressively downward. The cyanosis and toxemia became more severe and he expired thirteen days after admission.

Autopsy revealed the following:

**Gross examination.** A poorly nourished white male. The chest bulged somewhat to the right, laterally and inferiorly. No palpable superficial lymph nodes were encountered. A mass was palpated with some difficulty in the right side of the upper abdomen. There was a feminine distribution of the pubic hair. The left side of the scrotum was empty but thickened by edema in its dependent portion. The liver was a huge structure measuring 30 cm transversely, 26 cm longitudinally and 13.0 cm in thickness. The capsule was smooth except for a few slightly red, elevated areas where the parenchyma was replaced by spherical nodules of variable size, the largest 3 cm in diameter. These had a bloody red to brown red or gray red appearance and



Fig. 6 Case 1. Photograph taken at autopsy to show necromastix.



Fig. 7 Case 2. Photograph taken at autopsy showing metastatic nodules of lung, large liver with small hemorrhagic metastatic nodules and retroperitoneal mass presenting below liver.

centrally were soft and red. Elsewhere the parenchyma was flat and moderately bloody. The huge mass bulged to the right, displacing the inferior vena cava and aorta to the same side. The mass was covered by thin peritoneum and located to the right of the mesentery of the small intestine. The mass had the following dimensions: length 14 cm, width 12.5 cm, thickness 14.0 cm. There was one small mural nodule of the intestines 0.8 cm in diameter opposite the mesenteric attachment, which when sectioned varied from red to brownish gray. The pelvis of the right kidney was slightly dilated from pressure on the ureter by the retroperitoneal mass. In the midlateral aspect of each kidney there was a solitary nodule 1.5 cm in diameter. These had the same appearance as the other metastatic nodules. A similar nodule was seen in the right adrenal gland. The right testicle and epididymis were unchanged. The breasts were moderately enlarged and consisted of distinct, rather firm, fibrous mammary gland tissue. In the deeper portion of the left breast was a hemorrhagic blood clot like, circumscribed area 1.0 cm in diameter.

The lungs were huge structures. Numerous subpleural nodules elevated the pleura in a spherical, plateau like and loaf stool like manner. Over these the pleura was smooth and mottled red to brown. On sectioning there were huge



Fig. 8. Case 4. One of the metastatic nodules showing the characteristic cytology. Note the syncytial cells and the malignant cells of the Langhans type.

phenical firm to soft hemorrhagic appearing nodules the large 1.60 cm in diameter. The rest of the lung tissue appeared bloody and wet. No metastases were seen in the tracheobronchial lymph nodes. The right pleural cavity contained 150 c.c.m. of clear straw-colored rather thick fluid. The aorta was displaced some 10 cm to the right by the retroperitoneal mass. The inferior vena cava was surrounded on all sides by the retroperitoneal mass. Part of the wall had been eroded by the tumor and bare hemorrhagic rather smooth tumor tissue lined this part of the inferior vena cava.

*Microscopic examination.* Tumor. There were masses of syncytial cells. Some of the nuclei of these cells varied in size and shape and were hyperchromatic; others were vesicular and contained nucleoli. Five to six mitotic figures were encountered per high power field. Many large syncytial cells were noted which had an acidophilic cytoplasm. Large areas of hemorrhage were encountered which contained intact and poorly defined erythrocytes. Both Langhans and syncytial cells were encountered in the tumor and exhibited anaplasia. The nodules showed no stroma production and contained no blood vessels.

*Inter.* The only intact neoplastic cells occurred at the periphery of the nodules. The histological structure of these metastatic nodules was similar to that of the retroperitoneal tumor. Only an occasional group of intact hyperchromatic cells were encountered here.

*Lung.* Parts of the lung were replaced by neoplastic tissue and hemorrhage identical in appearance with that described before. The rest of the parenchyma showed edema and hyperemia. Many of the alveoli contained blood pigment laden histiocytes as well as erythrocytes, lymphocytes and an occasional polymorphonuclear neutrophil.

*Kidney.* Much of the parenchyma in the section was replaced by neoplastic tissue and areas of hemorrhage similar to that encountered in the other organs. There was some parenchymatous degeneration of the lining epithelium of the convoluted tubules.

*Adrenal gland.* A portion of the right adrenal gland was replaced by characteristic neoplastic tissue.

*Small intestine.* A small metastatic nodule occupied the wall of the intestine between the muscularis and mucosa.

*Right seminal vesicle.* No essential changes were present. *Right testicle.* No malignancy was present. There was moderate interstitial cell hyperplasia. No spermatozoa were present and only a few of the younger cells of spermatogenesis were encountered.

*Breast.* There were scattered groups of ducts and acini which showed budding and slight new acinous formation about which there was moderate small round-cell infiltration. The hemorrhagic area was a metastatic nodule.

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Paper read by abstract only

# OBSTETRICS

## PREGNANCY AND ITS COMPLICATIONS

Hirschheimer A. The Hippuric Acid Excretion Test in Pregnancy. *Am J Obst & Gynec* 1939 37 363

The excretion of hippuric acid after the administration of sodium benzoate by mouth was found to be subnormal in more than half of a group of women with uncomplicated pregnancies. A smaller group of patients who developed toxemia showed a somewhat higher incidence of the same depressed function. After delivery the same test showed increased yields of hippuric acid in almost all of the cases and a return to normal in those with low ante partum values.

With few exceptions hippuric acid was excreted rapidly when its sodium salt was given intravenously to normal pregnant women. Forty per cent of a small group of toxemic patients showed diminished excretion in this test. The intravenous hippurate test showed no significant changes post partum as compared to the ante partum results except in cases having low ante partum yields when the tendency was to return to normal.

The possibility of depressed kidney response to hippuric acid in pregnancy makes it necessary to check renal function in order to interpret the result when a subnormal value for hippuric acid excretion is obtained after sodium benzoate is given by mouth. Analysis of the urine for hippuric acid after the intravenous administration of sodium hippurate is recommended as such a check. The ingestion of sodium benzoate in pregnancy is followed by changes in the blood and urine uric acid levels similar to the changes produced in non pregnant individuals.

EDWARD L. CORNELL M.D.

Fray W. W. and Pommerenke W. T. Roentgenographic Pelvimetry and Fetalometry: Elimination of Errors Due to Movements Between X-Ray Exposures. *Radiology* 1939 32 261

The various methods of pelvimetry and fetalometry are reviewed. The author describes his own method which requires a standard to support 2 x-ray tubes above the patient with a constant focal film distance and a constant inter-focal distance. The standard is notched for reception of the tube and thus shift of the tubes is prevented. From the center of the standard mid way between the focal spots of the two tubes a plumb bob is suspended to center the equipment on the Bucky diaphragm and film. A simultaneous exposure of the film by both tubes is made; the intensity of each beam of radiation being independently controlled by separate filament transformers. The film when exposed shows double silhouette of both the maternal pelvis and the fetal head. The following points are marked on the film: the points farthest from the midline which represent the ends of the maximum transverse diam-

eter the points of the two oblique diameters extending between the sacro iliac synchondrosis and the iliopectineal eminences of the superior pubic ramus and points at the ischial tuberosities representing the ends of the interschial diameter. The authors believe that the true conjugate is best obtained by the lateral method of Thoms.

The accuracy of the new method proposed has been tested and the variation from the true measurement appears not greater than 1 mm. The measurement of the fetal head size may be subject to greater error because of changes in shape or rotation of the head.

The advantages claimed for the method described are the simultaneous use of 2 x-ray tubes which prevents movement of the fetal parts which frequently occurs when films are obtained in succession; the fixed character of the apparatus which prevents errors due to variation in the focal film distance and shift of the tube; and the decreased cost of examination due to the fact that only a single double exposed film is necessary.

HAROLD C. OCHSNER M.D.

Grier R. M. and Richter H. A. Pregnancy with Leucemia. *Am J Obst & Gynec* 1939 37 412

The frequencies of chronic and acute leucemia in the cases discussed by the author were nearly the same.

The course of the chronic cases may be as long as six years during which time some women have been pregnant more than once. Exacerbation during the pregnancy is the rule.

Only 1 case of chronic lymphatic leucemia has been reported. All the other chronic cases were of the myelogenous type. The majority of the acute cases were myelogenous and the ratio of this type to those of the lymphatic type was 11 to 8. Premature labor is frequent in the acute cases, less frequent in the chronic cases. The prognosis for the babies is good in the chronic cases after viability, but less favorable in the acute cases because of the frequency of premature delivery. None of the babies showed evidence of leucemia. Hemorrhage during delivery of the baby and the placenta was conspicuously uncommon. No women died of uterine hemorrhage among the chronic cases and only 1 woman died among the acute cases.

No treatment of leucemia has been satisfactory. In the chronic forms roentgen irradiation apparently aids in the production of a temporary remission of the leucocytosis and the symptoms. Blood transfusion has a very transient effect on secondary anemia but is the only treatment of value in the acute leucemias. Pregnancy should be avoided when leucemia is known to be present. Only in the chronic forms may it be permitted if the woman insists and if her condition is explained to her. Interference with pregnancy does not help the mother in either

form. It only tends to produce premature or non-viable babies. In the acute forms it shortens the mother's life.

EDWARD L. CORNELL M.D.

### LABOR AND ITS COMPLICATIONS

Dellepiane G. The Basic Physiopathology and Pharmacology in the Medical Treatment of Labor (I fondamenti fisiopatologici e farmacologici del trattamento medico del parto) *Ginecologia* Torino 1939 5 7

The object of rational medical treatment of labor is to ensure the greatest security with the least suffering and danger. Pregnancy and labor are analogous to the third and fourth stages in the menstrual cycle: the period of pregnancy corresponds to the phase of maturation of the corpus luteum in the menstrual cycle and the period of parturition and puerperium corresponds to the menstrual and post-menstrual phases. Thus there are neuro endocrine fluctuations in pregnancy and labor just as in the menstrual cycle. In one phase under the action of corpus luteum placental hormones anterior hypophysis adrenal cortex and the predominant vagal tone of the individual there is a relaxation of all the hollow organs with smooth muscle fibers particularly the uterus. In the next phase corresponding with the end of pregnancy and the beginning of labor there is a systolic or contractive reaction under the influence of the posterior hypophysis the adrenal medulla some placental hormones and folliculin of the ovary. However the problem of labor in all its aspects represents always an individual clinical problem. With due credit to all modern advances and theories we must still individualize the biochemical neuro endocrine and clinical characteristics of the parturient patient.

Modern researches are cited which tend to clarify our understanding of the mechanism involved in the beginning of labor. These studies have also shown how variously the uterine muscular fibers respond to particular hormones. Modern investigations on the general and tissue reactions of the individual are cited: thus the diminution in weight of the individual before the onset of labor the increase in the adrenalin content of the uterus and in the chromaffin cells of the uterine nerve ganglia hyperglycemia modifications in the plasma albuminoid alteration in the basal metabolism excess of potassium over calcium and increased carbon dioxide in the blood all indicate profound constitutional changes during pregnancy. Also there are variations in the physiology of pregnancy which must be taken into consideration. The duration may vary from two hundred and fifty eight to two hundred and ninety seven days in hypogonitism pregnancy is less prolonged than in hypergonitism while in dysgonitism there is a tendency toward abortion. All of these facts indicate the diverse modes of origin and evolution of labor in the individual especially if we include the mechanical conditions and the diseases of mother and fetus. Likewise with equal age multiparity and

similar skeletal structure, the individual prognosis and dynamic evolution of labor may vary with the situation and presentation of the fetus and the degree of accommodation of the lower uterine segment.

Furthermore a rational medical treatment of labor presupposes a thorough knowledge of the mechanism of labor in order to understand all the processes which eliminate obstacles to the progress of the fetus and at the same time favor the motor activity of the uterus. The basis of the medical treatment is the modern knowledge that the uterus is an organ richly innervated by the vegetative nervous system, which varies quantitatively and qualitatively in the corpus and in the cervical segment with a resulting correlation of function in the two segments which permits the corpus uteri to assume a motor function while the inferior segment acts as a canal of passage. Such a relative autonomy of the various uterine segments proved by precise clinical and experimental studies indicates the dependence of the corpus uteri on the sympathetic and the inferior segment on the parasympathetic nervous systems. The author believes that the sympathetic system acts as an excitomotor to the corpus uteri and that the parasympathetic system acts in the same way for the inferior uterine segment and the cervix but it inhibits the corpus uteri. The beginning and evolution of the function of labor is influenced by the neuro endocrine constitution of the individual. The physiological progress of labor is further modified by the varied response of the individual and his race: thus in the black race labor lasts longer than in the white race although the fetus is smaller and there are less mechanical difficulties.

If we may agree with Frey Kreis Scarpitti and others that the progress of labor depends on the number of contractions the resistance encountered and alterations of the muscle tone by rest and contractions rational medical treatment cannot be carried out without an evaluation of the number duration and intensity of the contractions as well as a knowledge of the basal tone of the uterine muscular fibers. Such observations are facilitated by the entrance into clinical use of accurate instruments such as the hysterotomograph or the electrohystereograph. Due to modern abnormal stimuli the uterine basal tone may degenerate and the two uterine segments may assume a perverted function (the syndrome of Schiele). It will be a grand victory for obstetrical medicine if some day we may be able to overcome such dystocias by medical treatment without resort to operative intervention. Such treatment will be able to sustain and imitate natural phenomena without harm to mother or child.

Now what medical means are at our disposal which coincide with our physiopathological premises and needs? The medical treatment may reinforce and modify the contractions of the corpus uteri and diminish the resistance of the lower part of the birth canal in short it may particularly affect the uterine dynamics. Medical treatment cannot offer any control of the resistance of the pelvic ring. The hunger

cure formerly advised to lessen the size of the fetus is not practiced any more nor is the intensive mineralization of the patient during pregnancy practiced any more since it interferes with the mechanics of labor by premature ossification in the fetus.

Formerly it was held desirable to maintain the integrity of the bag of waters for complete dilatation of the cervix but now since the work of Kreis this is considered inconsequential. Actually it has been advised by Schikele and Kreis to hasten the dilatation by artificial rupture of the bag of waters at the onset of labor aided by the administration of antispasmodic drugs. On the contrary some hold this procedure as harmful since it may induce a state of spasticity. However the author would credit Kreis with calling attention to the possibilities of controlling uterine dynamics with drugs. As for artificial rupture of the membranes the author would consider this only in certain cases in which the uterine dynamic conditions and the presenting part are completely understood and when the cervix is considerably dilated.

For relaxing the cervix and causing a relative analgesia a hypochloride diet has been suggested by Karpato and experimented with by Lorenzetti of Turin. The theory is that the plasma and tissue deficiency in chlorides leads to a dehydration of the tissues and induces a relative analgesia and increased relaxation of the cervix. Researches carried out in the author's clinic indicate that this result is due to the relative excess of bromides induced by this diet.

The uses of quinine and posterior pituitary lobe extract as oxytocic drugs have been thoroughly worked out. Opiate particularly papaverine act as analgesics and have a depressing effect on the uterine muscle. Likewise belladonna and its derivatives atropine and scopolamine especially the latter in a combination with morphine have been used to control pain with a minimal influence on the dynamics.

Nowadays these progress in the pharmacological physiopathological and clinical aspects of labor have thrown new light on these drugs and the possibilities of their suitable application. Important progress has been made in our knowledge of the active principles of *secale cornutum*, ergotamine and ergotamine are the most active. Their action is mostly on the smooth muscle. In small doses they excite and in large doses they paralyze the sympathetic terminals which do not react any more to adrenalin. Among the other principles which act on the uterus may be mentioned choline, acetylcholine, tyramine and histamine. However only histamine is present in sufficient amounts (of the last mentioned drugs found in *secale cornutum*) to produce any noteworthy action. Ergotamine and ergotamine are used chiefly in the prophylaxis and treatment of post partum atony. Finally Moir, Dale and others in 1932 found that an aqueous extract of *secale cornutum* contained an active principle which stimulated the uterine fibers and which has been called ergonovine. It has an action more rapid and intense than ergotamine or

ergotamine. It also lacks the anti-adrenalin action of the other alkaloids. Much similar to ergonovine is ergobasine isolated more recently by Stoll and Burckhardt. All these drugs are indicated in the third stage of labor; they are contraindicated in the stage of dilatation and expulsion.

As concerns the hypophysis it exhibits oxytocic, hypertensive and anti-diuretic actions. Recent researches indicate the isolation of an active principle from the posterior hypophysis which is identical in its action with ergonovine. The action of the oxytocic hormone of the posterior hypophysis varies with the neuro-endocrine condition of the individual and with the state of pregnancy or labor. The combined use of this extract with placental extracts and folliculin in labor has passed the experimental stage and is being tried in the clinic.

As concerns the oxytocic action of quinine recent studies show that it acts only when the uterus tends to contract spontaneously, namely in the last phase of pregnancy and at the beginning of labor. This finding will tend to clear the prescribing pharmacist of accusations of inducing abortion. Recently it has been found that calcium augments the excitability of the uterine muscle fibers. This may be of clinical importance in the initiation of labor with quinine or extracts of the posterior lobe of the hypophysis.

Vitamin C has an important action on the uterus. It is found in considerable amounts in the placenta. It acts as an antispasmodic, anti-hemorrhagic, antispasmodic substance on the fetus and an antispasmodic substance on the mother. This beneficial action of ascorbic acid is due to its reducing power which aids the metabolism of the uterine musculature.

The belladonna derivatives because of their depressing action on the parasympathetic system and their exciting effect on the sympathetic system would seem to find their greatest usefulness in the period of dilatation especially in the presence of a spastic or hypertonic resistance in the lower uterine segment. Atropine derivatives act purely on the muscle fibers and cause a relaxation.

As concerns the opiates their use is based on the general analgesic action of morphine and the peripheral depressing action of papaverine. A uterine muscle fiber which is relaxed by opiates is still susceptible to excitation by extract from the posterior hypophyseal lobe but not by *secale cornutum*. This is a proof of the divergent mode of action of the posterior lobe of the hypophysis and *secale cornutum* on the uterine muscle fibers. The use of scopolamine with all the alkaloids of opium results in a eutonic and hyperkinetic action on the uterus.

On the whole this is of physiopathology and pharmacology the medical treatment of labor is now a useful aid to the obstetrician and offers more possibilities for the future care of the mother and the child in the difficulties of labor. There are offered possibilities of systematic medical conduct of labor with a minimum of operative interference based on a high plane of active assistance instead of a passive conduct of labor. These medical methods of pro-

phylaxis and treatment are best used in dynamic dystocia only after intelligent and rational observation

JACOB E. KLEIN M.D.

### PUERPERIUM AND ITS COMPLICATIONS

Preisseecker E. Disturbance of Function in the Female Breast During the Sucking Period and Its Treatment (Die Funktionsstörungen der weiblichen Brust in der Stillperiode und ihre Behandlung) *Ergebn d inn Med u Kinderh* 1938 54, 102

The subject of this report is especially interesting and important as in the last few years the hormonal relationships between genital function and lactation have been established. The contribution of this author is especially clear concerning what is of importance, in consideration of the vast literature on this type of experimental hormonal investigation. He notes that the final relationships especially with the adrenal cortex are still lacking. It can be stated with certainty that the follicular hormone and the hormone of the corpus luteum are the preparatory factors for lactation which in turn is initiated by the lactogenic hormone of the anterior lobe of the hypophysis. In order to make this relationship clear to the reader he has included in his paper the schematic pictorial representation of Lieble published in the *Zentralbl f Gynaek*.

After the physiology of lactation, the disturbances of function in the female breast especially hypogalactea are discussed. Here also the author should be commended on his clarity and brevity and not giving details about things which are now generally known. The treatment of hypogalactea with vitamins for which the entire vitamin alphabet appears to be adapted is something new. The arti-

ficial arrest of lactation or weaning is discussed from the hormonal point of view.

The bibliography is well assembled except for a few omissions and can be recommended to anyone who wishes to become familiar with this field.

In conclusion the author states that in spite of our advance in knowledge concerning vitamins and hormones and in spite of the indisputable triumphs made in the laboratory, we must still recognize that the best method for stimulation of a poorly functioning mammary gland is thorough mechanical emptying by the sucking child, the pump, or manual milking.

Therefore, in the final analysis, our knowledge concerning the hormone and vitamin cycles represents interesting laboratory results but unfortunately is without practical application.

(F. SIEGERT) RONALD R. GREENE M.D.

### MISCELLANEOUS

Gray, J. Kenny M. and Sharpey Schafer E. P. Metastasis of a Maternal Tumor to Products of Gestation. *J Obst & Gynaec Brit Emp* 1939 46, 8.

A case of anaplastic tumor of the suprarenal gland with extensive metastases including growth in the uterus and placenta is recorded. Secondary malignant growth in the child did not occur during the six months of life. Thus in spite of the placental involvement survival with multiplication of the tumor cells was confined to the tissues of the individual in whom the tumor had arisen. In 3 of 6 cases in the literature, the maternal tumor metastasized to the fetus. In only 1 was the tumor proved to be present in the mother, the placenta and the child.

CHARLES BARON M.D.



# GENITO-URINARY SURGERY

## ADRENAL KIDNEY AND URETER

Frattini P. G. Descending Pyelography in Contusions of the kidney (La pielografia discendente nelle contusioni del rene) *Arch ital di chir* 1938 49 557

In his experiments on rabbits Frattini used intravenous pyelography by injecting 3 c cm. of perabrodil solution per kgm. of body weight after having caused varying degrees of contusion by direct digital compression of the right kidney. The object of the experiments was to study the roentgen pictures that could be obtained by the intravenous method of pyelography the diagnostic possibilities of the method especially when employed immediately after the traumatism the eventual consequences of the injection of contrast substance on the general condition of the subject and on the healing process of the involved kidney and finally the evolution of the healing process. Lately he has applied the method of descending pyelography in 2 cases of accidental traumatism to the kidney 1 of which he reports in detail.

The author feels justified in concluding that

Only a temporary inhibition of the renal function follow even a serious traumatic lesion of the kidney except in cases in which the renal artery has been ruptured. The method of descending pyelography is advisable for the study of renal traumatism its harmlessness allows its immediate or nearly immediate use after the traumatism has occurred. The descending pyelogram shows the anatomical and functional condition of the kidney and thereby indicates the treatment to be applied if the pyelogram does not reveal any increase in the opacity of the renal shadow or any visualization of the upper urinary tract there is good reason for suspecting a lesion of the vascular pedicle. However in cases in which notwithstanding the gravity of the clinical picture increased opacity of the renal shadow and visualization of the upper urinary tract are present the kidney has retained its function and watchful waiting is indicated provided that the condition of the patient or some complication does not impose urgent surgical intervention. During the process of healing the method allows following up of the functional condition of the renal parenchyma and of the urinary tract besides it gives valuable information on the condition and function of the contralateral kidney. Intravenous urography is a simple secure and innocuous diagnostic mean of determining the damage done and the location of the lesion it may be combined with the ascending method if the renal shadow remains absent.

RICHARD H. MEL M.D.

Lee H. P. Nephrobronchial Fistula with Reports of 2 Cases *J Urol* 1939 41 117

Bronchial fistula should be suspected in those cases in which the patient gives a history suggesting

a pathological process in the kidney or perinephric abscess accompanied or followed by pulmonary symptoms severe cough and profuse sputum. Some degree of pulmonary involvement probably accompanies many perinephric abscesses but the sudden onset of severe cough and profuse purulent sputum is a particularly significant symptom of bronchial involvement. Physical findings suggesting perinephric abscess râles or dullness in the overlying lung base and elevation of the diaphragm with an overlying inflammatory process in the lung (as shown by x ray films) may give additional evidence. Cysto copy and pyelography may reveal nothing or one may find pyonephrosis with escape of the pyelographic medium into the perirenal area occasionally the patient may taste or even expectorate the pyelographic medium. Rarely can the nephrobronchial tract be visualized with x rays.

Drainage of the perinephric abscess usually results in immediate and marked relief of the cough and sputum with a more gradual but usually complete clearing up of the pulmonary involvement. When the kidney is markedly involved nephrectomy may be necessary later.

Two cases of nephrobronchial fistula are reported  
ELMER HESS M.D.

Caporale L. Two New Personal Methods of Fixation of the Kidney Nephropexy with Catgut Sling and Nephropexy with Irenrenal Subcapsular Loops of Catgut Sutures (Su due nuovi metodi personali di fissazione del rene. A. La nefropessi con nastro di catgut. B. La nefropessi con anse sottocapsulari perirenali di filo di catgut) *Arch ital di urol* 1938 15 598

Perirenal fixation in case of prolapse of the kidney superior to other methods because it produces insignificant anatomicopathological changes. In his experiments on dogs Caporale found that the use of a catgut sling left the renal function unaltered and that the catgut was resorbed in from thirty to forty five days and was replaced by connective tissue adhesions 7 to 8 cm. wide which became stronger with the lapse of time. This encouraged him to use the method in man for whom he devised two methods.

In the first for which he employs catgut ribbon he exteriorizes the kidney and makes in its capsule two horizontal parallel incisions just wide enough to allow passage of the catgut ribbon and as far apart as the width of the ribbon. Three passages are provided on the anterior and three on the posterior aspect of the kidney and one passage on each of its poles the ribbon is tied at the upper pole. Incisions are then made for a second ribbon to be installed on the outer half only of the transverse axis of the kidney this ribbon is passed under the first reversed and tied on the convex surface of the kidney. The two upper heads of the ribbon are fixed in the tenth

intercostal space and the two outer heads to the lumbar mass

In his second method, he uses catgut ligatures mounted on an ordinary straight needle. Starting at the upper part of the anterior aspect of the kidney he passes the needle under the capsule for about 2 cm., keeping one fingerbreadth from the convex border of the organ. Three passages bring the needle out at 1.5 cm. from the lower pole where the ligature turns around the convex border to the posterior aspect with one or two passages and it is returned by way of the concave border to the anterior aspect where three passages bring it out at the level from which it started. Another ligature is introduced in the same manner on the posterior aspect of the kidney and the corresponding ends of both ligatures are tied together. Ligatures forming a simple loop in the vicinity of the concave border are installed on both aspects in the transverse axis of the organ, and the corresponding ends of these ligatures also are tied. Fixation of the heads of the ligatures is the same as in the first method. An advantage of this method is that by pulling on the various ligatures it is possible to make the kidney assume its original position as nearly as is feasible. Experiments on dogs have shown that strong connective tissue adhesions are also obtained with these ligatures. Excellent late functional results have been demonstrated with both methods in several patients. RICHARD KEMEL, M.D.

Graves R C and Buddington W T Nephrostomy Indications and Technique *J Urol* 1939 41 265

Nephrostomy is a conservative operation and affords a direct channel for drainage of urine or infectious material to the surface of the loin when the normal excretory passages are closed or inadequate. It provides a safe substitute for nephrectomy in certain cases of bilateral disease. It may serve as a temporary expedient or as a permanent solution of the problem. The most common reason for nephrostomy is to provide safe and certain drainage for the kidney following the removal of stones through its cortex. Such drainage is usually temporary and may be dispensed with when bleeding and infection have been controlled. It affords an invaluable opportunity for direct lavage of the renal pelvis for the removal of clots and stone fragments and for bringing about the necessary bacteriological and chemical changes to make the kidney a less favorable place for the further formation of calculi. All irrigations should be performed with utmost gentleness with avoidance of overdistention of the pelvis. There should be less rather than more hurry for removal of the tube and before its removal the ureter should be open and ready for normal drainage. This is determined by noting whether mercuriochrome or indigocarmine enters the bladder after their installation into the renal pelvis or by roentgenography with opaque media. Chills and fever following the withdrawal of the tube may be the signal for its replacement. The next most common indication

for nephrostomy is temporary drainage of the kidney during healing of the lines of suture in plastic operations upon the renal pelvis or upper ureter. The tube should be carefully placed, it should traverse the lower calyces so that dependent drainage is assured and in such position that its tip will inflict the least possible injury to the pelvic wall, especially at the ureteropelvic junction, so as to avoid a stricture.

The following indications for nephrostomy as encountered in the authors' cases are discussed: (1) renal drainage following the removal of stones through the cortex, (2) renal drainage during healing of the lines of suture following plastic operation upon the renal pelvis or upper ureter, (3) ureteral occlusion by malignant disease, (4) acute ureteral occlusion by edema following electrocoagulation or irradiation of tumor of the urinary bladder, (5) bilateral nephrolithiasis with marked impairment of the total renal function, (6) the first step in a two-stage nephrectomy, (7) bilateral hydronephrosis usually congenital in origin and often associated with atony of the ureter above and below the point of stenosis with marked impairment of the total renal values, (8) obstruction of the ureter by impassable inflammatory stricture, (9) an associated procedure with uretero-intestinal anastomosis, and (10) a life saving measure in profound toxemia from severe ptylitis of pregnancy when milder measures have failed.

The operation is done under regional or local anesthesia. Except occasionally when the kidney is greatly overdistended and thin walled, nephrostomy for drainage should not be attempted through a stab wound through the cortex as with this method it is impossible to determine whether the tube is well placed within the excretory passages. The parenchyma may be thick and the pelvis relatively small. The cortex is soft and friable and readily penetrated with a blunt instrument. The wall of the renal pelvis, however, may be quite resistant so that the tube or instrument introduced from without may be deflected along the side of the pelvis and be useless for drainage, although palpation in the region of the renal hilus may lead to the belief that the cavity of the pelvis has been entered. The authors employ a malleable stylet for this purpose, which is introduced through an opening in the upper ureter or preferably the extrarenal portion of the pelvis, and is then led out through the cortex via the inferior calyces if possible to emerge from the convex border of the lower pole of the kidney. The nephrostomy tube may be attached to this and drawn downward into the pelvis. Following the suggestion of Cahot a silk thread is attached to the tip of the stylet drawn downward through the kidney and out of the opening in the pelvis or ureter. The distal end of the tube is attached to the thread and the outer end of the thread is pulled as a guide. The authors then draw the tube out through the cortex until its proximal end lies in the desired position within the pelvis. Irrigation with normal saline solution is then used to wash out clots and infectious material. Usually

the ureterotomy or pyelotomy incision is not closed, as these openings heal with a properly functioning nephrostomy and provide additional drainage. Rubber tube wicks are led to this region in front and in back of the kidney before the wound is closed. The cortical wound is closed snugly around the tube with mattress sutures of plain catgut which include bits of fat or muscle to prevent cutting through. The tube is made to emerge in the flank. Care must be taken, however, that the path to the kidney is not made too tortuous and the changing of the tube be complicated unnecessarily. Undue angulation of the tube may be avoided by a stab wound just above the last rib. In long term or permanent nephrostomies it is well to suture the renal capsule to the lumbar fascia along the upper edge of the wound to prevent changes in renal position and direction of the sinus.

An ordinary soft black rubber drainage tube with additional openings for the portion lying within the renal pelvis is used. It is kept in position by a fine nonabsorbable suture to the skin and if necessary by a suture of plain catgut to the renal capsule. In permanent or long term nephrostomies the tube is removed after two or three weeks and replaced by a soft rubber whistle tip catheter which is kept in place with a rubber opercular disc.

Until convalescence is well established the maintenance of diuresis by parenteral fluid therapy and support of the circulation is very important. The urine should be kept acid to prevent alkaline incrustation in and around the tube. The position of the tube should be checked occasionally by means of retrograde pyelography. **Lotis Newkirk M.D.**

**Fagerstrom D. P. Ureterectomy: Its Indications as an Adjunct to Nephrectomy. *J. Urol.* 1939 41: 137**

In performing nephrectomy it is customary to remove a small portion of the ureter and this holds true in a large majority of cases. There are occasions when as a result of gross disease and structural changes the ureteral stump becomes a source of chronic ill health which can be relieved only by secondary ureterectomy. Secondary operations are often extremely difficult and are attended by considerable risk. It is therefore manifest that primary nephro-ureterectomy is the procedure of choice when there are indications that the ureter left *in situ* may prove a menace.

Ureterectasia frequently accompanies hydronephrosis. In both hydronephrosis and pyoureteronephrosis primary total ureterectomy is indicated. Partial ureterectomy frequently leaves behind a pouch that may produce all the symptoms of an infected and poorly draining vesical diverticulum.

Ureteral calculi in the ureteral stump often require secondary operations. It therefore becomes of paramount importance to determine the patency of the ureter prior to nephrectomy and should the factor of drainage be in doubt the more radical procedure of nephro-ureterectomy will often prove to be the more conservative surgery.

In cases of nephrectomy for tuberculosis fistulas may persist for months because of a diseased ureteral stump while secondary infection from ill advised drainage and tuberculous infiltration of the renal pedicle and particularly of the surrounding fat may all serve as chronic foci of wound infection.

Such instances are not uncommon and they confirm the opinion that diseased structures other than the ureter are often responsible for postoperative complications. The author therefore believes that when a tuberculous ureter harbors such structural changes nephro-ureterectomy will often spare the patient the distressing complications that retard recovery.

In tumors of the renal pelvis and ureter practically all surgeons today agree that the indications for total ureterectomy approach the absolute. The tendency of papillary growths to spread by surface extension and mucosal implantation makes mandatory the ablation of the kidney and the entire ureter including resection or thermal destruction of the ureteral meatus. When a ureter which has been left behind (due to no apparent or palpable involvement) is removed a few months later because of recurrent hematuria a large number of these vegetations may be revealed.

There are a few other indications including primary ureteral neoplasms which occur in the lower segment of the ureter for total ureterectomy. The ectopic ureter is usually markedly dilated and found in association with a kidney that is either malformed or rendered almost functionless by infection.

The author concludes that nephro-ureterectomy is indicated without question in cases of papillary tumors of the renal pelvis. In other types of pathology the indication hinges mainly on the size and hydrodynamics of the ureter. When grossly infected kidneys are removed it is unwise to leave a large non-draining ureteral pouch. **ELMER HASS M.D.**

**Boord A. C. and Ferrier P. A. Primary Carcinoma of the Ureter. *J. Am. Urol. Ass.* 1939 11: 590**

The authors report 6 proved cases of carcinoma of the ureter and a probable seventh. From a careful study of the literature they concluded that 1 per cent of the carcinomas of the upper urinary tract originate in the ureter.

Age does not seem to play an important part in this pathological condition. The youngest patient having been twenty-two and the oldest eighty-nine years of age. Hematuria was a prominent symptom in 72 per cent of the cases and pain occurred in 60 per cent. The tumor may be palpable.

Cystoscopic and x-ray studies with urographic exposures are of diagnostic value. In about 30 per cent of all the cases reported protrusion of the growth at the bladder end of the ureter was visible which aided materially in the establishment of the diagnosis. The treatment in these cases was early surgical nephro-ureterectomy. In all instances the prognosis is very unfavorable.



The authors state that 5 additional cases have been described by Charles C Higgins

J SYDNEY RITTER M D

### BLADDER, URETHRA AND PENIS

Godard H Exstrophy of the Bladder and Epispadias in the Male (l'exstrophie vésicale et l'epispadias masculins) *J urol med et chir* 1939 47 97

Godard describes a method of operation for exstrophy of the bladder in which the bladder is invaginated and its abnormal orifice closed it is freed from its peritoneal attachments brought down in the pelvis and fixed to the perineum precractally with perineal derivation of the urine The bladder may then be controlled by the anal sphincter, or later a plastic operation on the urethra may constitute the normal urinary passage This operation is not to be attempted until the child is five or six years of age It is not to be expected that these patients will urinate entirely normally but a fair degree of continence can be obtained

The author reports 3 cases operated upon by this method in the first case after a plastic operation on the urethra, urination was fairly normal, the boy lived three years in good health and then developed an acute pyelonephritis that caused his death In the second case the operation was done on an infant of five months (at too early an age), and death resulted from postoperative shock In the third case following a plastic operation on the urethra the esthetic result was good, but urinary continence not perfect although the condition was much improved

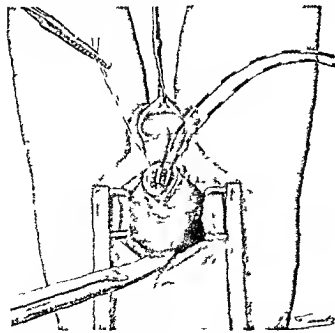


Fig 1 Liberation of the sac of the bladder Note the plane of cleavage in the posterior superior zone of the peritoneum

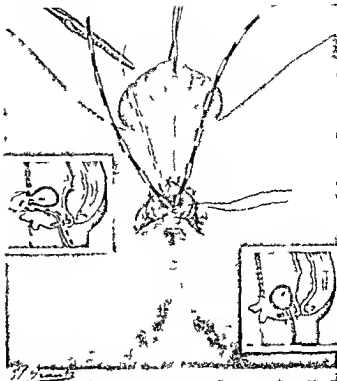


Fig 2 Descent of the bladder in the pelvis and precractal perineal fixation of the neck of the invaginated bladder At the left after the creation of the precractal opening the forceps picks up the traction suture Below and to the right the descent is terminated

Lepoutre has reported a fourth case operated upon by this method the patient was a boy two years of age too young to permit determination of the degree of urinary continence which will be obtained

ALICE M MEYERS

Dillon J R The Value of Gradual Decompression and Preliminary Drainage in Bladder Neck Surgery *J Urol* 1939 41 164

The author takes a firm stand against proponents of rapid complete emptying of the chronically distended bladder The fact that from 85 to 90 per cent of patients can withstand sudden decompression is no reason for endangering the lives of the remaining 10 or 15 per cent, with the possible loss of 4 or 5 per cent who cannot endure it Illustrative cases are presented to show disasters eventuating from too rapid evacuation of the bladders in vesical neck obstruction and the more fortunate results in cases treated by gradual decompression

If according to the long accepted idea, catheterization causes a sudden fall in the intrapelvic pressure of the kidney and produces edema and hemorrhages into the parenchyma and pelvis, thus explaining hematuria and renal failure, it may also produce an ideal field for infection Such infection may be present from the start especially in cases with ureteral reflux With the renal congestion resulting from sudden decompression, suppurative foci in the renal parenchyma are further aggravated

The amount of residual urine or the extent of bladder distention is not the only criterion upon which to base the rate of decompression. Blood chemistry is a valuable guide but most important to the author is the first sign of loss of appetite or malaise. Such an observation should be a warning to slow up the decompression force fluids and keep the patient in as much of a Fowler's position as he will tolerate. This can be facilitated by putting high shock blocks under the head of the bed to combat reflux and favor gravity drainage of the kidneys.

ARTHUR H. MILBERT M.D.

### GENITAL ORGANS

Ascoli R. An Infrequent Inflammatory Form of Disease Attacking the Male Genitalia: the So Called Spontaneous Gangrene of the Genitalia. (*Di una non frequente forma infiammatoria a carico dei genitali maschili la cosiddetta gangrena spontanea dei genitali*) *Arch. ital. di urol.* 1938 15 505

Ascoli reports the case of a man aged sixty seven years who had a disturbance of micturition with some pollakiuria for one year and turbid urine for some undetermined time and developed a diffuse swelling of the penis with fever, general malaise and aggravation of the urinary disorder three days before admission. The swelling was limited to the superficial tissues of the penis only and the urethra was not involved. On the day after admission the swelling had increased notwithstanding treatment and a number of ecchymotic patches were noted which later turned black and necrotic. After suprapubic cystostomy to put the urethra at rest and prevent any irritation incision of the lower aspect of the penis gave issue to a yellowish fluid which infiltrated the tissues. Regression of the edema began three days later and elimination of the necrotic parts was complete on the thirteenth day after admission.

Spontaneous gangrene of the genitalia may be confused with a whole series of infections of the genitalia of urethral origin. In the present case the distinct impression was gained for some time that there was question of a urinary infection of urethral origin. However some signs of common penurethritis were absent: the swelling was evenly distributed over the whole surface of the penis; there was no increased swelling and pain of the urethra and of its cavernous body compared to the remaining part of the penis; nor any signs of urethral stenosis and the swelling was strictly limited to the pendulous portion of the penis and showed no tendency toward extension to the abdominal wall or the scrotum.

As to the pathogenesis of the case the patient had prostatic difficulty and at least during the initial period of the disturbance presented septic urine and urinary disturbances. It is most probable that the infection occurred through the urine and that the portal of entry of the infection was an erosion of the prepuce macerated by the frequent passage of urine.

Various treatments have been proposed for the disorder as there is no immediate urgency for surgical intervention because of the lack of a tendency toward spreading on the part of the disease. The treatments include local applications of antiseptic solutions, partly intravenous and partly intramuscular administration of anti gangrenous serum (from 150 to 200 c.c.) and the injection of strong doses of arsphenamine. However surgical intervention seems to be more logical for the ample drainage of the infiltrated tissues and application of antiseptic solutions. Relatively superficial incisions suffice; they do not offer any particular gravity and can be made without recourse to general anesthesia. It also seems advisable to associate with the surgical intervention all the measures likely to favor the process of healing such as serum therapy.

RICHARD HENSL M.D.

Hinman F. The Treatment of Prostatism. *J. Am. M. Ass.* 1939 112 424

In a well written concise article the author reviews the present day prostatic problem. Prostatic bars or contractures, hyperplasia and malignancies are viewed as distinct pathological entities with the recognition that they may overlap and be complicated frequently by infection and calculi.

On a pathological basis the theoretical and practical points in the surgical approach are thoroughly emphasized. As a result of previous training and biased opinions many urological surgeons are unable to fit the theoretical surgical procedure to a patient. The author observes that in many institutions of training in urology only the suprapubic or perineal operations are emphasized while in other institutions only the transurethral operations are emphasized.

The merits of the suprapubic, perineal and transurethral operations are painstakingly evaluated. The suprapubic operation carries a mortality of from 8 to 20 per cent (average 8 per cent), hospitalization is from thirty to forty days, the technical difficulties are not great and the functional results are good if the patient survives. The perineal operation for the unskilled is technically difficult and

the fear of impotence, of incontinence and of fecal fistula is overcome only with complete mastery of the details of technique. The functional results are good. The greatest advantage of the perineal operation is in the treatment of carcinoma because it is the only method which cures cancer. If carcinoma is suspected emphasis is placed on early diagnosis by perineal exposure or apiration biopsy and micro copsections. The improved modern perineal operation entails an average mortality of 3 per cent and hospitalization of from fifteen to forty days.

Admitting that transurethral prostatic surgery is popular and that in expert hands the mortality may be as low as 1 per cent, the over enthusiasm has spent itself. The author believes that a high rate of recurrences on the basis of incomplete operation is inevitable and that the poor results with complicat-

116 185  
J. 12127001 P. 116

ing infections will outweigh the questionable factors of safety short hospitalization, and its futility in the cure of cancer. In large series of prostatic resections many earlier cases are being included in which the risk of prostatectomy would not have been advised. These earlier cases are better surgical risks hence the mortality should be reduced. Because such large series of resections have been reported during the past decade the question is again raised as to whether or not many patients are being subjected to this procedure when surgery is not indicated or when palliative measures may preclude the necessity of surgical intervention.

The author again presents to the profession his vast experiences and excellent results following perineal prostatectomy. By careful study organization and masterly improved technique the perineal approach is the procedure which he has found to be the most reasonable and logical.

LEANDER W. RIBA, M.D.

Davis E. Prostatectomy or Resection? *J. Im. U.* 133 1939 112 681

The author in February 1938 sent letters of inquiry concerning prostatic resection to all the fellows and active members of the American Association of Genito Urinary Surgeons and to every tenth name included in the alphabetical roster of diplomats of the American Board of Urology. Over 95 per cent of these inquiries were answered and this article is a summary and digest of the first 100 replies received.

Of these 100 urologists 21 are classified as resection extremists (those who perform resection in more than 90 per cent of their cases of prostatic disease) and 2 are prostatectomy extremists (those who do no resections or who resect only fibrosis bars and carcinoma or those who do less than 20 per cent of their prostatic operations by transurethral resection). The remaining 57 per cent he classifies as selectionists. Among these 100 urologists there were 8 who do practically all their prostatic operations transurethrally and 8 who do not use this method at all.

More than 80 of these urologists recognize both advantages and limitations of prostatic resection and favor selection of cases as determined largely by the size of the gland. A skillful few, however, rather than fit the operation to the patient have succeeded in fitting the patient to the surgeon.

The mortality rate and the functional results of transurethral resection bear a definite relationship to the skill and experience of the operator. The number of urologists who are tending to decrease their percentage of resections is distinctly greater than the number tending to increase this percentage.

Davis believes that transurethral resection after passing through a typical trial and appraisal cycle including both abuse and over correction is now approaching the final stage of stability with a clearly defined field of usefulness.

THEOPHIL P. GRAUER, M.D.

Nesbit, R. M. Transurethral Prostatectomy *J. Im. U.* 133 1939 112 687

In this paper the author writes mainly of technical refinements in transurethral prostatectomy. He believes that serious sepsis in these cases is usually due to an introduced organism rather than an organism which the patient already harbors. In the author's practice a closed system of irrigation and drainage is used both in pre operative catheter drainage and postoperatively which is a distinct advance as it decreases the introduction of infection.

In patients with urethral stricture or narrow urethras who require transurethral operation the author rather than traumatize the urethra too much performs a penile urethrotomy and inserts the instrument through the opening. Such an opening will permit the safe use of instruments considerably larger than those now used.

Nesbit advises rectal palpation during resection for accurate estimation of the amount of tissue which must be excised. Pressure exerted upward or medially by the finger also aids in bringing tissue into the path of the cutting loop.

A refined resectoscope has been devised so that the operator can now work entirely with one hand, leaving the other free to guide safely the excision of tissue by rectal palpation.

These refinements in technique have increased the scope of transurethral prostatectomy and have tended to decrease the limitations.

THEOPHIL P. GRAUER, M.D.

Thompson W. O. and Heckel, N. J. Undescended Testes *J. Im. U.* 133 1939 112 397

Presenting an extensive bibliography the authors give a critical analysis of the present status of glandular treatment of undescended testes and find a marked discrepancy in the percentage of successful results. They conclude from their work that it is important to maintain an open mind on the treatment of undescended testes with the pituitary like principal (anterior lobe) since many of the reports appear to be overenthusiastic. Descent was produced in only 10 of 50 (20 per cent) undescended testes in 38 patients of all ages as compared with an average of 61 per cent of successful reports in the literature. Descent did not occur in any of their cases in which the testes were intra abdominal or deflected over the external oblique muscle.

In evaluating the effect of treatment it is important to exclude all cases of pseudocryptorchidism. It is possible that this principle causes descent only of those testes which would descend without treatment about the time of puberty. The value of this form of treatment depends upon the importance of getting the testes into the scrotum as early as possible. If early descent is important the management of cases of undescended testes involves the intelligent combination of medical and surgical measures, with discontinuance of the medical treatment before genital growth becomes excessive.

D. E. MURRAY, M.D.

Nielsen Christensen E. Cryptorchidism and Its Treatment with Sexual Hormones (*Ueber Kryptorchismus und seine Behandlung mit Sexualhormonen*) *Acta path et microbial Scand* 1938 Supp 37 p 301

In recent times the problem of cryptorchidism is receiving greater consideration from the hormonal point of view although for a long time this disturbance had awakened chiefly surgical interest. Operation was performed to establish more or less successfully normal relations and to avoid possible complications. Other associated conditions such as certain symptoms of sexual dyscrinism were considered of minor importance in the reports and collective statistics. Occasionally authors turned their attention to these conditions e.g. Schapiro who found normally developed sexual organs only 5 times in 44 patients. He was the first to employ hormone treatment with surprising success. The study of hormonal biology was first brought to prominence by Sand in 1913 by his experiments with cryptorchidism. It was shown that the artificially cryptorchid testicles degenerated considerably in from four to eight weeks. Spermatogenesis ceases while the Leydig cells are not affected or increased. This is attributed to abnormal pressure also to the effect of temperature. The high abdominal temperature is harmful. If such testicles are returned to the normal position the epithelium regenerates. The production of testicular hormone is said to be increased rather than diminished in cryptorchids. However in the author's opinion the production of testicular hormone is accomplished chiefly by the germinative epithelium. The principal sexual hormone center is the hypophysis. After removal of the hypophysis degeneration of the seminal epithelium occurs. In artificially established cryptorchidism in rats an increased quantity of gonadotropic follicular hormone was secreted. Decant was accomplished by the administration of Prolan B which is found in large quantity in the urine of pregnant women. It is a hormone of luteinization derived from the placenta but also present in the hypophysis. It would be expected that the treatment of cryptorchidism would be especially successful in those cases which present conditions pointing to a reduced or restricted production of testicular hormone.

Two groups of patients must be distinguished. Group I with retention of the testes but appearance otherwise normal. Group II with retention associated with infantilism, more or less obesity and eunuchoidism. According to the present conception Group II is especially perhaps solely eligible and suitable for the hormone treatment and extraordinarily favorable results are reported from many sources. Most investigators have employed Prolan B but a preparation containing both the hormone of the hypophysis and the testicular hormone is apparently more effective. Certain difficulties are experienced with the dosage. A daily dose of from 1,000 to 2,000 rat units is adequate.

Boys from twelve to fourteen years are best adapted to the hormone treatment. The duration of the treatment is from a few weeks to a few months. Certain dangers such as premature development of the genitalia must be recognized in time if possible. The final result cannot be determined with certainty at present because the treatment is still too new.

For Group I operation is indicated but hormone treatment may be employed first.

For Group II hormone treatment as far as possible should be given.

(ROEDELUS) J M SALMON, M.D.

## MISCELLANEOUS

Ferguson C, Buchholtz M and Cromer R. Sulfanilamide Therapy in Gonorrhea. Review of the Literature and Report of 298 Cases. *J M Sc* 1939 197 452.

The authors present an excellent review of the literature pertaining to sulfanilamide therapy in gonorrhea. Comparative charts of the method of treatment, the results and the complications encountered by various authors are correlated and compared with a series of 298 cases of acute and chronic gonorrhea as treated by the authors.

It was concluded that sulfanilamide has bettered the treatment of gonorrhea but that older forms of therapy will continue to have a definite role. Large dosages were used in all the authors' cases (all hospitalized). The drug as given (120 gr daily for two days followed by 60 gr daily for three days) divided doses at four hour intervals (night and day) was rapidly excreted and there was rarely a really dangerous reaction. Relatively few relapse after apparent cure with sulfanilamide over follow-up periods were reported. It is believed by the authors that inadequate dosage administered prior to an adequate dosage and course of sulfanilamide seems to impede the action of the drug and that local treatment does not seem to be warranted simultaneously with sulfanilamide. The reason for the failure of the drug in approximately 25 per cent of the cases is unknown but certain seemingly pertinent inferences have been drawn.

D E MURRAY, M.D.

Silvers C H deT and Henderson A P. A Clinical Study of 49 Cases of Urinary Calculi Requiring Surgery. *J Urol* 1939 41 366.

The authors enumerate the clinical and chemical findings in their 49 cases of urinary calculi and attempt to correlate the findings with the suspected causes. As possible causes they mention the possibility of metabolic factors and an infection with or without obstruction. They did not find any increase in the blood calcium or any decrease in phosphorus as evidence of hyperparathyroidism in 12 of their cases. Twenty-five patients in the series had infected teeth, 2 had advanced pyorrhea and there were 4 with large infected tonsils. In 1 case the staphylococcus albus and the streptococcus were re-

covered from the root of a tooth and the staphylococcus was recovered from the left kidney, which contained a moderate sized calculus. In another case a non hemolytic streptococcus was recovered from the root of a tooth and from the right kidney, and a stone was found in the pelvic portion of the right ureter. However, the focal infection in the remaining cases did not correspond with the organisms cultured from the urine.

Renal calculi were found in 14 cases, all unilateral, stones were in the pelvis in 7 cases, branched calculi in 3 cases. Nine stones showed colon bacillus, 6 were found in acid urine, 2 in alkaline and 1 in neutral. It was not possible to determine whether the infection found at examination preceded or followed the calculus formation. All patients showed definite improvement in back pressure following removal of the calculus. Nephrectomy was done in 1 case, nephrolithotomy in 4 cases, and pelvolithotomy with nephrostomy in 9 cases. No cases in which the stones were small were operated upon without first giving the stones an opportunity to pass following ureteral dilatation. In every case there was definite evidence of uroastasis with infection.

Ureteral calculi were found in 7 cases, 6 of which presented infection from the bacillus coli and 1 from the non hemolytic streptococcus. Four cases showed weakly acid urine, and 3 strongly acid urine. All patients recovered promptly from the operations and there were no recurrences in from three months to four years. The authors do not favor metal cystoscopic ureteral instrumentation for the removal of ureteral calculi because of pain to the patients before the calculi finally pass and because of the danger of injury to the ureteral wall which occasionally occurs.

All foci of infection were cleared up either before operation or soon thereafter.

Vesical calculi were found in 26 cases and all were associated with bacillus coli infection. They were behind mechanical obstruction with 2 exceptions. In 10 cases the urine was alkaline, in 9 acid, in 2 weakly acid, and in 5 neutral. This group of cases is divided into those found in the presence of adenomatous hypertrophy, contracture of the vesical neck, urethral strictures, and transvesical drainage. The authors believe that a certain number of these calculi were formed in the kidney, for some stones may slip down from the kidney without producing any marked symptoms. In 1 case a calculus was found attached to an unabsorbed suture in the anterior wall of the bladder with no obstruction to the vesical outlet or in the urethra. In none of the patients presenting calculi with obstruction in whom the obstruction was properly removed did the calculus recur, even though the infection was not entirely cleared up. In 2 patients in whom the stones reformed, some obstruction remained at the vesical outlet.

Urethral calculi were found in 2 cases and they have not recurred following dilatation or surgery.

Quantitative chemical analyses of the calculi were made of the dried powdered samples, for calcium, ammonium phosphorus, uric acid, oxalic acid, and carbonic acid, by the adoption of microchemical methods used in blood chemistry in which as little as 50 mgm. may be used. Qualitative tests were made for the less frequently occurring constituents, such as cystine, fibrin, xanthin, and creatinin, which are found as impurities.

CLAUDE D. HOLMES, M.D.

# SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

## CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS, ETC

Haberland H F O Traumatic Osseous Tuberculosis (Die traumatische Knochentuberkulose)  
*J internat de chir* 1939 4 1

The medical literature is so conflicting regarding the incidence of primary traumatic osseous tuberculosis and even as regards the possibility of producing the condition experimentally that Haberland is inclined to attribute the discrepancies in the results to uncontrolled sources of error (faulty hemostasis improper splinting of experimentally produced fractures and attempts to inoculate the human type of tubercle bacillus into animals). The author experimented on rabbits by means of intravenous injections of bovine tubercle bacilli following surgically controlled fractures of the radius crest of the humerus and the ribs (including bone implants) and did not succeed in a single instance in inducing primary traumatic osseous tuberculosis. He believes that unless the work of Bouquet and Laspoti who claim to have by special methods produced with some regularity blood borne tuberculous bone infections should prove to be revolutionary the trend of medical thought will tend more and more toward regarding the development of a primary tuberculous process at the point of trauma to a previously healthy bone as only a bare possibility.

In this regard Haberland points to the beneficial and curative effects from grossly traumatizing operations on already existing osseous tuberculous lesions (bone splinting of tuberculous hips and spines). He regards the reports of outbreaks of bone tuberculosis at the point of accidental or operative trauma as lacking sufficient data (no roentgenogram at time of trauma) and explainable on the basis of the studies of Steiko. The latter reports finding in 80 per cent of his cases of bone tuberculosis evidence of old foci the condition in each case therefore being a secondary outbreak of a previously latent primary tuberculous focus.

Since these foci of Steiko were situated mostly in the epiphyses Haberland advises surgeons to keep away from the epiphyses when possible in operations involving the bony skeleton.

JOHN W. BRENNAN M.D.

Arzela I Solitary Fibrous Osteodystrophy with Transformation of Sarcomatous Aspect Compared with Other Osseous Dystrophies (Osteodistrofia fibrosa solitaria con trasformazione di aspetto sarcomatoso in confronto con altre distrofie ossee) *Chir d'ogni di movimento* 1939 24 197

The diseases of Paget and of Recklinghausen are generally of fibrous osteodystrophies the first showing a tendency to bony reconstruction while the second inclines toward destruction and is accom-

panied by hypercalcemia and adenoma of the parathyroids the two diseases can be differentiated clinically roentgenologically and anatomopathologically. Multinodular localized fibrous osteodystrophy is considered a separate disease on account of its benign course although it presents decided roentgen and histopathological similarities to Recklinghausen's disease. Solitary fibrous osteodystrophy differs from the other localized dystrophies through its peculiar and rare clinical and anatomical picture. Some authors consider giant cell tumor with regard to its relations with localized fibrous osteodystrophy as an individual osteodystrophy while others deny the neoplastic nature of the tumor but admit the possibility of its transformation into localized cystic osteodystrophy. A solitary osseous cyst must be distinguished from localized fibrous osteodystrophy according to some while others insist on the impossibility of making a distinction between the two disorders.

Arzela describes a case of solitary fibrous osteodystrophy in a girl aged eleven years the only lesion found at roentgen examination was located between the middle and lower thirds of the right humerus and was completely healed by emptying the cavity and filling it with two pieces of fatty tissue. At logical examination of the material obtained at operation showed transformation of the bone marrow into fibrous connective tissue, thinning of the cortex and the presence of osteoid trabeculae rich in osteoblasts and of large and numerous zones of fusiform cells which had assumed characters of sarcomatous aspect and gave the general impression of the presence of an energetic process of hyperplasia.

The pathogenesis of all localized osteodystrophies is still uncertain all have a benign course although they may undergo real blastomatous or neoplastic transformation. Their clinical characters have only a relative value for differential diagnosis. Age (more than forty years) serves only to distinguish a secondary tumor from these disorders which always appear in younger subjects pain is common to all but the site of the lesion may give some information as the giant cell tumor occurs in the epiphysis solitary fibrous osteodystrophy in the vicinity of the epiphysis and all others in the diaphysis. Roentgen examination is of great importance and although difficult will usually help in the differentiation of all these osteodystrophies from malignant tumors. However biopsy will solve the diagnostic problem but in order to be of decisive value, it must include superficial and deep material because osteogenetic sarcoma giant cell tumor, and localized fibrous osteodystrophy may show a similar fibrosis in their superficial parts. As a matter of fact, Vecchiarelli insists on the necessity of inclusion in the biopsy of the healthy tissue the limiting tissue of the tumor and the neoplastic tissue itself for purposes of com-

parative study. Bloodgood recommends irradiation twenty four or twenty eight hours before biopsy in order to sterilize the neoplastic cells. Diagnostic irradiation of osseous tumors is recommended by the Paris Radium Institute.

The treatment of all localized fibrous osteodystrophies is the same. Statistics show that conservative treatment is the method of choice. It consists in extensive opening and cleaning out of the cavity and filling it with transplants of living tissue especially adipose or muscular tissue. Radical intervention may be advisable in recurrences or when the continuity of the bone cannot be preserved. Some authors recommend radiotherapy as the only treatment. Others give postoperative irradiations.

RICHARD KEMEL, M.D.

Jones S. G. Volkmann's Contracture. *Ann. J. Surg.* 1939 43 325

It is important to recognize and remember that Volkmann's ischemic contracture can be prevented. Fasciotomy performed early gives this opportunity. Prevention is more important than treatment. Once contracture has developed, conservative treatment is indicated. Muscles that have become fibrosed and contracted cannot be fully restored. The more severe cases may be partially benefited by plastic surgical procedures.

Experimental work on animals has borne out the observation that obstruction of the circulation alone does not cause the contracture. It has long been accepted that obstruction of a main artery in an extremity causes dry gangrene with flaccid paralysis. Obstruction of a principal vein results in wet gangrene. Ligation of the vessels of an extremity has produced flaccid paralysis with or without gangrene. Trauma to nerves also results in flaccid paralysis with lengthening of the muscles at times but never fibrosis and contracture.

It becomes evident that there is something more than circulatory and nerve disturbance in the production of Volkmann's contracture. That added factor is extrinsic or intrinsic pressure. Pressure follows an injury to the elbow region associated with a supracondylar fracture. Pressure impairs the arterial and venous circulation. Pressure plus the infiltration of the tissues with blood results in ischemic necrosis. Hemophilia alone has caused Volkmann's contracture.

The pressure may be extrinsic such as results from wooden metallic or plaster of Paris splints applied too tightly or intrinsic resulting from too acute flexion of a swollen elbow or pressure from a subfascial hematoma. The result is the same. Pressure impairs the circulation directly injures the tissues and results in fibrosis and shortening.

The anatomical structure of the forearm and elbow favors the production of Volkmann's contracture. The forearm and elbow are encased in a firm resisting fascial envelope. Hemorrhage within this envelope cannot escape and tremendous pressure results. Furthermore in certain cases the ana-

tomical structure of the region contributes an added factor. The bicipital fascia crosses the elbow joint and is firmly attached to the biceps tendon and flexor muscles of the forearm. The brachial artery lies directly beneath this fascia which may be put under great tension by intrinsic hemorrhage, edema, and swelling of the tissues.

In the past there has been considerable argument as to whether obstruction to venous outflow or impairment of arterial circulation was the cause. There is no question but that there is some obstruction to venous outflow. As pressure increases due to extravasation of the blood and serum with swelling of the soft structures the veins being more readily compressed are affected first. There certainly is an unyielding fascia. As pressure is further increased obstruction of the arterial circulation occurs. This obstruction may be due either to actual arterial damage or to interruption of the arterial flow from intrinsic pressure on the artery. In most instances a combination of a few or all of these factors brings about a disintegration of the soft tissues due to pressure, hematoma and anemia.

The best preventive against development of Volkmann's contracture is accurate reduction of the supracondylar fracture. If in addition to a faulty reduction the elbow is placed in a too acute flexion position if too tight bandages or splints are applied or if a hematoma develops in the antecubital space paralysis and contracture may develop. Roentgenograms are imperative to make sure displacement has not occurred and frequent observations of the hand for color, temperature and the condition of the radial pulse are necessary. Coldness, color change, numbness, loss of muscle power in the flexor muscles and absence of the radial pulse constitute an indication for fasciotomy. This is true especially if there is in addition a painful swollen elbow with evidence of hematoma in the antecubital space. The reviewer has attributed some value to the rather marked tenderness upon light pressure over the flexor muscles of the forearm and complaint of pain in them upon voluntary or passive motions of the fingers—signs indicating a fasciotomy.

Absence of the radial pulse alone does not constitute an indication for operative interference. The radial pulse will sometimes become palpable by decrease of the flexion at the elbow or it may be congenitally absent. The use of a Kirschner wire through the olecranon to maintain reduction is a dangerous procedure because valuable time is lost. The damage is done early, certainly during the first few hours in an impending case of Volkmann's ischemic contracture. If the fasciotomy is performed early it relieves the pressure beyond doubt. An incision is made on the flexor aspect at the elbow over the hematoma just medial to the biceps tendon. The fascia is opened widely. Muscle tissue and blood which have been under great tension will be liberated. In certain cases the bicipital fascia will be found to be under great tension and exerting tremendous pressure upon the brachial artery which

passes beneath it. This fascia is incised. The artery, vein, and nerve may be observed to ascertain the presence or absence of injury. The fascia is left open, the skin being loosely sutured. A posterior molded plaster splint is applied and the arm is elevated upon a pillow. As one becomes more accustomed to the anterior approach, it is often possible to reduce the fracture through the fasciotomy wound.

The author calls attention to the dangers of malpractice suits in these cases and advises consultation. The consultant should determine accurately the severity of the injury, the time interval between injury and consultation, and the treatment given in order to protect both his own and the physician's interests. Volkmann's contracture occurs also in the absence of splints or tight bandages.

The conservative and plastic operative treatment of Volkmann's ischemic contracture in its different stages of duration and severity are discussed. Case histories emphasizing certain points in judgment regarding what treatment should be pursued, photographs, drawings, and roentgenograms are presented.

ROBERT P. MONTGOMERY, M.D.

Sassen, W. von. Tuberculosis of the Trochanter Major and of the Bursa in the Neighborhood of the Trochanter. (*Die Tuberkulose des Trochanter Major und der Schleimbeutel der Regio trochanterica*). *Beit. kl. u. Chir.* 1938, 168, 594.

Six cases of tuberculosis of the trochanter major have been observed during the last ten years in the Koenigsberg Clinic. In the German literature this disease is considered to constitute only a small percentage of the total bone and joint tuberculosis, by Jacini and Langhert 1.0 per cent of the total and by Sven Johansson 2.33 per cent. Four of the patients whose detailed histories are available were treated by operative exposure of the neighborhood of the trochanter and removal of the diseased bursal bone and muscle parts. Early diagnosis is essential and it should be remembered that tuberculosis of the trochanter is most prevalent in the second and third decades of life. Authors are divided as to the point of origin of the tuberculosis, whether it occurs first in the bone or first in the bursa. One author states that in 3 of his cases it was undoubtedly in the bursa as the roentgenogram showed only slight changes in the bone although the disease was of long standing with fistula formation. In another case, however, he regards the bone as the place of origin of the tuberculosis because soon after the onset of the disease there was widespread destruction of the trochanter.

Roentgenologically tuberculosis of the trochanter is characterized by cyst-like transparent areas in the bone, irregular cortical markings, sequestrations in the neighborhood of the bone, and by small pieces of cortex becoming detached by muscle pull. In general, tuberculosis of the trochanter and of the bursa shows only a little propensity to progress, yet 3 cases are cited in which, through spreading to the hip joint, the disease produced great danger to the pa-

tient. According to most authors the treatment demands the widest possible removal of all diseased tissue. If treatment is started at the beginning before too great extension of the disease, the average case should proceed to healing in two or three weeks. (KEMP) HAWTHORNE C. WALLACE, M.D.

Hauser, E. Muscle Imbalance of the Foot. *Surg. Clin. North Am.* 1939, 19, 101.

The author's discussion on muscle imbalance of the foot falls under three general headings. The first group of cases are those in which the muscles acting on the foot are called upon to do more work than they can carry out. This occurs when the individual stands or walks strenuously or for an abnormally long time or when there is a disproportionate increase in the body weight. When muscles are weak as a result of brief or prolonged inactivity or the wearing of deforming shoes, a similar overwork of muscles ensues.

A second type of foot imbalance occurs when power is lost in one group of muscles while the opposing group retains its power. This may occur in anterior poliomyelitis or peripheral motor nerve injuries and often results in contractures of the stronger group.

A third type of muscle imbalance develops secondary to a persistent deformity. The displacement of the Achilles tendon insertion laterally, which occurs in persistent valgus deformity of the heel, gives the calf muscles a lateral component of force supplementing the strength of the pronators of the foot. In hallux valgus deformity, the rotation of the great toe results in displacement of the insertion of the abductor hallucis muscle plantarward and laterally and thus removes it as an opposer, the muscles tending to displace the toe laterally. This latter group is induced to assume the hallux valgus deformity also by an additional lateral component of force resulting from the lateral displacement of the insertions of the long flexor and extensor hallucis muscles, the tendons of which come to lie lateral to their normal positions.

Three case reports are included. In the first case in which there was simply functional decompensation, the patient was treated conservatively. She was given corrective shoes with a straight inner sole, a low broad heel, thick leather sole, and no metal shank. These shoes were padded with felt insoles. External corrections were added subsequently; they consisted of an anterior bar with inclined plane which tended to pronate the forefoot and inclination of the plane of the heel for supination of the hind foot with anterior extension of the heel under the shank. During these corrections, the gait and posture of the patient were improved. Padded conventional women's shoes were worn when fashion compelled it. Relief from pain resulted.

In the second case, an equinovarus deformity of one foot was noted when the patient first walked. She was seen by the author when she was eighteen years old. The anterior tibialis, the quadriceps



and the peroneal muscles on the affected side were weak. The author describes the surgical treatment with a manipulative footboard and tourniquet followed by tenotomies and plantar fasciotomy. A recurrence was treated by stabilization operations upon the midtarsal and subastragalar joints and an original tendon transplantation devised by the author.

In the third case, the author treated a ballux valgus deformity by resection of the projection on the head of the first metatarsal and transplantation of the displaced insertion of the abductor hallucis muscle medially. Circulation of the foot was improved with Unna's paste boots and shoe corrections were instituted.

ROBERT PORTIS, M.D.

### SURGERY OF THE BONES, JOINTS MUSCLES, TENDONS, ETC

**Petit, P.** The Treatment of Acute Osteomyelitis in Adolescents (*Le traitement de l'ostéomyélite aiguë des adolescents*). *Presse méd.* Par 1939, 47: 284.

In recent years the principles of treatment of acute osteomyelitis in adolescents have again come up for discussion, especially as regards new or revived surgical methods. Most French surgeons have adopted Lannelongue's rule of immediate trepanation in all cases, and but few advocates of simple incision of the abscess as recommended by Kirmisson in 1907, have appeared. In consideration of the various clinical forms of osteomyelitis it seems logical to conclude that no one rule of treatment could apply to all. Individualization of treatment and a thorough knowledge of the advantages and disadvantages presented by the different methods in use form a prerequisite for improvement in results. The value of incision, trepanation, and subperiosteal resection, respectively, is discussed in detail by Petit.

In the great majority of cases of acute osteomyelitis simple incision of the periosteal abscess gives good results, though in numerous instances puncture will suffice, and in still others prolonged immobilization will lead to spontaneous resorption. Simple incision is indicated in cases of abscess of superficial bones such as the tibia, but in deeper abscesses—as for instance those of the femoral location, diffuse edema of the soft parts obscures the findings so that the question of where and when to incise cannot be determined. In such cases it is necessary to await more definite signs of localization. Trepanation is a more serious intervention accompanied by considerable shock. It permits only inadequate drainage or incomplete removal of the infectious foci. Further, more this operation may lead to spread of the infection to normal bone marrow from the subperiosteal abscess and favors dissemination of bacteria into the general circulation. The mortality rate following trepanation was twice as great as that following simple incision as a routine procedure, and the incidence of complications and metastases was likewise doubled. Thus exclusive of cases of deep cen-

tral abscess of the bone, trepanation is contraindicated in osteomyelitis.

Subperiosteal resection is a much more satisfactory method. It involves complete removal of the infectious focus and thus insures rapid cure and prevention of a protracted course of disease with resulting complications. In "early" resection the bone is removed before sequestration, while the periosteal sheath is still elastic and non-adherent during the first weeks of febrile osteomyelitis. This early resection may be primary or secondary, corresponding to whether it is the first treatment applied or follows earlier unsuccessful treatment. "Late" resection is that practiced at a time when the necrotic bone is surrounded by a sheath of new bone. The periosteum is more or less adherent to this new bone. The writer believes that only early resection is justifiable because it alone guarantees a satisfactory regeneration of bone. The technique is described in detail. Whatever method is used, drainage and gauze tampons should be avoided. Although benign in themselves, these operations may involve serious shock to debilitated patients and should for this reason be preceded by a blood transfusion. The latter may also be performed during operation.

Once resection is completed, strict immobilization is indicated. A bivalved plaster cast made before operation permits placing of the limb in a perfectly correct position in the cast after operation. In resections of the femur or tibia the knee should be immobilized in semi-flexion to avoid fixation in an improper position. The plaster and dressing should not be removed or renewed for at least a month in spite of the unpleasant odor which may arise. The course of the temperature will offer a sufficient guide as to the condition of the focus. As a rule the results of this operation are excellent with marked improvement in the general condition and subsidence of the symptoms within a few days or even on the day following operation. At the end of a month regeneration of bone is usually far advanced and by the fortieth day it is completed. The new bone gradually assumes normal shape. Fractures of such new formed bone heal in normal time. Wedge-like resections of this regenerated bone for cosmetic purposes will not cause a flare up of inflammation or retard consolidation at the site of osteotomy.

Although failure of previous treatment usually presents the indication for resection, the cases of primary resection are increasing. However, very early primary resection is to be discouraged as it constitutes a blind procedure, and is as harmful as premature incision in cases of staphylococcal infection elsewhere. Resection of a diaphysis should not be attempted until the patient is afebrile. Secondary early resections are indicated when the inflammatory symptoms persist and threaten the life of the patient, their extent may be determined roentgenologically. In such cases all diseased but no normal bone should be resected in the presence of fever or pus, and one should not delay until prolonged suppuration has destroyed the periosteum.

Petit recommends immobilization in a plaster cast with constant observation every day of the general condition and variations in temperature blood analyses too must be made regularly. The findings will be a guide as to the proper time for intervention. Immobilization has a beneficial effect on the general condition the temperature becomes more normal and the toxic symptoms disappear. In cases with positive blood cultures the organisms usually disappear from the blood before the temperature becomes normal. Within a few hours the relief from pain transforms the patient. By such expectant treatment septicopyemia may be prevented. In a few days the general disease is transformed into a local process an ordinary suppurative focus to be treated as such. The course of the latter is much more frequently benign than hitherto supposed. The abscess which forms should be evacuated after subsidence of the symptoms by simple incision without drainage followed by interval dressings without removal of the plaster cast.

In cases in which the local inflammation does not subside following incision of the abscess the osseous focus should be removed by subperiosteal resection but only after elimination of other foci of suppuration. If performed during a period in which the infection is strictly limited to the bone such secondary early resections will be followed by excellent results. Bone regeneration is satisfactory. By adapting the form of treatment to the general and local findings suppurative arthritis may be prevented. Joint effusions have often collected before immobilization. They are either rapidly resorbed or may be drained by one or two puncture. True suppurative arthritis most frequently follows lesion of the metaphysis and epiphysis at the cartilaginous junction which has been partially destroyed. Prompt diaphyseal resection affords the best prophylaxis. In cases of articular apparation arthrotomy will not suffice. An associated evacuation of the bony foci is indicated with resection of the metaphysis and of the involved epiphysis through the perforation in the cartilaginous junction. This procedure is preferable to simultaneous resection of the diaphysis and epiphysis because removal of the cartilage will definitely inhibit the growth of the involved limb.

LUTH SCHACHT MOORE

FACINI D. Late Picture of Arthrodesis of the Hip in Coxitis. Evolution of the Graft Focal Changes. (Il quadro tardivo dell'artrodesi di l'anca nella coxite. Evoluzione dell'innesto modifichazioni focali). *Arch Ital di chir.* 1938 49 639.

Of 85 extra articular arthrodesis performed for coxitis at the Marine Hospital of Valdosta, FACINI has verified the results obtained in 45 after a lapse of time varying from three to eight years dating from the operation. The age selected as appropriate for the operation ranged from twelve to fifty years the latter being subsequently changed to forty.

Extra articular arthrodesis is effective in the cure of coxitis and is indicated during the stage of repair

of the disease and for its sequelae. It does not replace or shorten the long period reserved for stimulation therapy which in association with the strict immobilization of the involved joint raises the defensive powers of the organism. When the operation is performed during the beginning of the stage of repair, it accelerates the process of healing and thereby shortens somewhat the course of the disease. It allows early removal of apparatus during the stage of convalescence and affords greater assurance of cure.

The operation is indicated especially in the following sequelae of coxitis: intra articular and extra articular pseudarthrosis, painful rigidity, non progressive recurrence of the cold type (opening of fistular sinuses which discharge very little, contractions, painful crises and early fatigue on getting up) or chronicity of the process due to the deficient residual movement of the joint, contraction of the extremity in flexion and adduction after clinical healing of the process in adults. It has been proved that in children and adolescents the operation performed to correct a vicious attitude of the extremity falls short of the desired results.

The arthrodesis favors intrafocal bony ankylosis. This mode of repair has been shown to occur more than twice as often in cases treated in this manner as in those treated without surgery. Among the various methods proposed the extra articular drawbridge method gives the best results with rapidity of fusion and hypertrophy and shows the smallest number of failures. This operation is indicated especially in children up to the age of eighteen years. In adults the insufficient elasticity of a pedicled iliac flap makes it advisable to use an extra articular tibial graft transplant.

In all cases in which the iliac flap was used it was cut to a width of at least three fingerbreadths to ensure its solidity and rigidity. After initial decalcification of more or less intensity according to whether the iliac flap or a transplanted graft was used uniform recalcification occurred and the ends of the graft fused with the structure of the pelvis and of the great trochanter acquiring in the roentgenogram the density of the surrounding bone and a regular trabeculation.

RICHARD KETNER, M.D.

## FRACTURES AND DISLOCATIONS

CABBANS W. R. Callahan J. J. and Scuderi C. S. Compound Fractures of the Elbow Joint in Adults. *Am J Surg* 1938 42 637.

The custom of driving an automobile with the left elbow protruding from the car window has produced an increasing number of severe compound comminuted fractures involving the elbow joint.

The treatment of the wounds in these injuries is the same as employed in other compound fractures. The wound is covered with a sterile gauze and the surrounding skin is cleansed with soap and water. Soap water and normal salt solution are used to cleanse the wound and wound edges. No antiseptic solutions are used. All avascular tissue dirty wound

edges, and separated dirty bone spicules are excised and removed. If dirt is deeply impregnated into a bone fragment it should be removed with a chisel or rongeur. The wound is then irrigated with a large quantity of saline solution and sutured loosely. Dry dressings are applied and changed every six hours during the first two days so as to obtain the maximum capillary drainage and to prevent fermentation. When extravasation of serum decreases sufficiently, the dressings may remain unchanged until the sutures are removed. Using this method of treatment the authors have recorded 91 per cent clean wounds regardless of the extent of injury.

If in all extensive compound fractures involving the elbow joint or anywhere else, antitoxin for gas bacillus and tetanus infections is given early and in curative doses of 20 000 units of polyvalent gas antitoxin and 5 000 units of tetanus antitoxin there will rarely be an infection with either of these organisms. In those cases with compound fractures about the elbow that are complicated by a gas bacillus infection from 150 000 to 200 000 units of polyvalent gas antitoxin are given and the wound is enlarged until it is possible to make a complete debridement of all gas infected tissue. Potassium permanganate crystals are then placed in the wound and hydrogen peroxide may be used locally. Following the operation a potassium permanganate solution of 1:3000 is used and is alternated every six hours with hydrogen peroxide irrigations. The dressings are changed frequently and a heat cradle is placed over the wound to keep the temperature at 100° F. This regime is followed until the temperature of the patient has lowered considerably and there is improvement in the local lesion. The authors state that they have never been required to amputate an arm for any infection and this covers a period of thirty six years for one of the writers. They feel certain that roentgen therapy for gas bacillus infection has little if any value. In the 8 cases of proved gas bacillus infection that were treated with roentgen rays without surgery or antitoxin there were 8 deaths.

In compound comminuted fractures of the distal end of the humerus where several combinations of fractures may occur an ordinary hook screw is inserted into the flat portion of the ulna in adults which is about  $1\frac{1}{2}$  in. distal to the proximal end of the olecranon. Five to ten pounds of weight are attached to the hook screw and the forearm is supported by adhesive or skeletal traction. The advantages of the hook screw traction over the use of the Kirschner wire is that the ulnar nerve cannot be injured, the procedure of insertion is simpler and there is more stability and no slipping.

Compound comminuted dislocations of the elbow are reduced and fixed in slight flexion in plaster molds which are applied in such a manner so as to avoid any pressure on the open wound. If lacerations are extensive a circular cast is used.

Lateral traction by means of a band of saddles is applied to the forearm with the elbow flexed 90 degrees and the forearm in full supination, is used in

fragmented or compound fractures of the ulna in which metal traction is contraindicated.

In compound fractures of the radial head combined with a compound fracture of the olecranon and dislocation of the radial head, a silk suture is threaded through a transverse drill hole in the proximal end of the distal ulnar fragment and through the triceps tendon at its insertion into the olecranon, the ulnar fragments are then apposed. Only the fragments of the radial head that are completely separated are removed. Removal of the entire radial head is not advisable because of subsequent angulation at the elbow and pain at the distal radio ulnar joint due to downward protrusion of the ulnar styloid.

In comminuted fractures of the lower end of the humerus and the proximal portions of the ulna and radius metal fixation is seldom used because of the danger of an increase in the frequency of infection. Silk or catgut is much better tolerated. Chrome plated steel screws are used occasionally in T shaped fractures of the humeral condyles.

Slight malpositions as seen in the roentgenograms should not be overemphasized and used as a basis for changing the positions of the fragments.

All force should be avoided in mobilizing an injured elbow. Forced motion under general anesthesia is definitely contraindicated. Carefully controlled active and passive motions in the elbow should be started early. These can be started with the hook screw in the olecranon. The maximum amount of motion in the elbow is rarely obtained in less than one year following a compound comminuted injury. ROBERT P. MONTGOMERY, M.D.

**Cherlinzoni, G.** The Mechanism of Production of Fractures of the Lumbar Transverse Processes (Sul meccanismo di produzione delle fratture delle apofisi trasverse lombari) *Chir. d. organi e movimenti* 1939 24 255

Cherlinzoni reports 5 cases of fracture of the lumbar transverse processes due to striking the lumbar region or the involved side during a fall on an icy street, on the edge of a toboggan slide (3 cases), and in a motorcycle accident, and recalls the data of normal and pathological anatomy and physiology of the lumbar region. The frequency of fracture is in direct relation to the length of the processes, the third process being most often involved. The fracture occurs usually in the middle and distal parts of the process and the line of fracture is slightly oblique from above downward and from inside outward. The position of the fragment is generally good but it may be displaced upward or outward seldom downward or inward. According to most authors the greater frequency of fractures of the lumbar transverse processes, compared to those of the cervical and thoracic regions is due to the length, thinness, and fragility of the processes, their transverse direction and the distance separating them, the insertion of strong muscular bundles on them and their relatively poor protection against external violence.

As to the mechanism of production of the fractures, the opinions of the authors differ, some accepting the direct action of the traumatism some denying it and some defending an indirect mechanism by muscular contraction. Undoubtedly the question often remains unanswered because of the lack of precision in the anamnesis in which cases it is easy to attribute the fracture to indirect action on the other hand cases have been reported in which the indirect action cannot be denied and often the obscure modality of the traumatism does not allow clear determination of the mechanism. However this does not apply in the present clearly cut cases of persons falling violently and striking the lumbar region or the side on the edge of a step on the edge of a toboggan slide or on the ground. Besides it is well known that the movements of torsion of the spine which are inevitable and in factive when a fall is imminent place the transverse lumbar processes in a more superficial position and consequently expose them more to the traumatic action while their length separation and transverse direction added to the mobility of the spine facilitate injury by direct action which probably occurs more frequently than is generally accepted even in cases in which the patient falls with his back flat on the ground. The upward displacement of the broken fragment is also in favor of a direct action. Ecchymosis in these fractures no matter what their mechanism of production is usually late and of little value in determining the mechanism but it always occurs and is often located retroperitoneally along the aponeurosis of the iliac psoas the irritation it

causes may give rise to nervous disturbances. The direct traumatism usually does not involve the kidney because it is well protected by its position and by the anatomical elements which surround it.

RICHARD KEMET, M.D.

Tinker M B Tinker M B Jr Kerr A T and  
Sawdon W M Fracture of the Neck of the  
Femur J Am M Soc 1939 112 791

The authors present statistics derived from the recent literature on the treatment of fracture of the neck of the femur and from questionnaires sent to physicians residing within a hundred miles of the city. Two thousand and seventy four cases were collected from the literature and 573 from the questionnaires. More than half of the cases from the literature were treated conservatively most of them by the Whitman plaster spica after reduction. The average percentage in which bony union was obtained was 51 per cent. In most of the remaining cases which were treated by open operation internal fixation methods were used and bony union was stated to have occurred in 78 per cent. The results from the questionnaires showed that the Whitman plastic spica after reduction simple Buck's extension and simple bed rest with or without sand bags each were resorted to in about one third of the cases. Few attempts at internal fixation were made. Buck's extension and Whitman plasters after reduction gave good result in about 50 per cent of the cases. The authors present a device to aid in the insertion of J Austin Moore nails for internal fixation.

ROBERT POATIS, M.D.

# SURGERY OF THE BLOOD AND LYMPH SYSTEMS

## BLOOD, TRANSFUSION

Heinild S. Observations on Essential Thrombopenia (Morbus Maculosus Werlhofii). *Acta med Scand* 1939 98 383

The author defines essential thrombopenia as a non familial disease of unknown origin. It is characterized by spontaneous hemorrhage of the skin and mucous membranes. Examination of the blood reveals a greatly lessened platelet content, a normal coagulation time and an absent or prolonged clot retraction. The red and white cells are normal in their quantitative and qualitative conditions except for a simple hypochromic anemia due to excessive hemorrhage. The bleeding time is prolonged and the capillary resistance always decreased.

The acute form may in certain cases take a lethal course within a few weeks. The chronic form usually lasts several decades and occurs in from 75 to 90 per cent of the cases. The chronic form has a typical intermittent course. Women are more often affected than men. The first manifestations often appear at the time of puberty or the climacteric.

The author divides thrombopenic conditions into four main groups:

1. Essential thrombopenia in which the etiology is unknown. Deficiency of the capillaries is an important factor in this type.

2. Symptomatic thrombopenia which seldom has a dominating symptom but occurs in many cases of acute infectious diseases or intoxications. It is found in non treated cases of pernicious anemia, aplastic anemia in certain cases of leucemia and with metastatic tumors of the bone marrow.

3. Thrombopenia caused by anaphylactic hyperergic processes. This type might possibly be regarded as a symptomatic thrombopenia but it differs from that type in its characteristic origin and the absence of severe alterations of the bone marrow.

4. The hypersplenic thrombopenia. Examples of this group occur with diseases such as Banti's and Gaucher's diseases and with hyperplasia of the spleen in malaria and lymphogranulomatosis.

The records of 6 patients are presented in detail by the author: 1 patient having the acute and 5 the chronic type of thrombopenia. The author reports and presents his conclusions relative to examinations of the bone marrow, the hormonal conditions, the plasma proteins, the blood cholesterol and the serum ascorbic acid. He concludes that no parallelism can be proved between the quantity of the megakaryocytes in the bone marrow and the thrombocytes of the peripheral blood in cases of essential thrombopenia. Nor has it been possible to prove qualitative characteristic alterations of the megakaryocytes.

The number of thrombocytes in the peripheral blood is undoubtedly influenced by the hormones

the exact relations concerning these facts are still unknown. However it seems quite probable that the disturbance of hormone balance at the time of the menopause under certain conditions may dispose to thrombopenia. The thrombopenia is probably not caused by the cessation of folliculin production. Hypothetical considerations as well as experimental examinations prove that folliculin is of no value in the treatment of essential thrombopenia.

Numerous examinations recorded in the literature indicate that in a large number of conditions a well pronounced parallelism exists between the increase of fibrinogen and globulin in the plasma and the increase of the number of blood platelets in the peripheral blood. Examinations made by the author reveal that no definite state of dependence exists between the plasma proteins and the blood platelets. Five cases of essential thrombopenia with considerable reduction of the blood platelets showed no variation in the plasma proteins fibrinogen and globulin especially are always found in normal values. Additionally, normal numbers of blood platelets were found in the 2 cases of hypoproteinemia and 1 case of hyperproteinemia showed a reduction in the number of platelets.

Normal values of blood cholesterol were found in 5 cases of essential thrombopenia. It is asserted that no condition of definite dependence exists between the content of cholesterol in the blood and the capillary resistance. Patients with essential thrombopenia have even if they take apparently sufficient food, a spontaneous content of serum ascorbic acid below the normal values for the period concerned. Treatment with ascorbic acid succeeded in producing an increase of the values in all cases. The number of thrombocytes was not influenced however the capillary resistance was increased to a certain extent but never reached the normal standard.

In his consideration of the anti hemorrhagic vitamins the author notes that some workers have found an increase of thrombocytes because of the effect of sesame oil (or a vitamin E factor contained in the sesame oil) but it has been impossible to confirm this effect in the 4 cases of essential thrombopenia recorded here. There is no reason to suppose that Vitamin K should be of any importance in the treatment of essential thrombopenia since the coagulation time has been investigated by special determinations. The author points out that the examinations made by several contemporary workers as well as his personal examinations show that decrease of capillary resistance is a dominant factor in the clinical course of thrombopenia. Stryphon which is derived during the production of adrenalin may improve this deficiency of the capillaries to a certain degree. The deficiency of the capillaries seems to bear a closer relationship to the clinical condition than the degree of thrombopenia. Moreover the

deficiency of the capillaries is a constantly present abnormality of fundamental importance in this disease because its degree of severity coincides with the clinical manifestations

In a discussion of splenectomy this writer states that the good effect seems due more to the improved function of the capillaries than to any increase in the number of platelets. He concludes that the examinations reported herewith show that conservative treatment when consistently effected may cause a considerable improvement in the function of the capillaries and consequently improve the condition of the patient. HERBERT F. THURSTON, M.D.

Page A P M Seager K G and Ward E M  
The Use of Placental Blood for Transfusion  
*Lancet* 1939 236 200

The details for the collection of placental blood which is to be stored and used for transfusions is outlined. Blood is not taken when there is any transmissible disease, premature labor, multiple pregnancy or when the membranes have been ruptured for forty-eight hours. Sodium citrate in saline solution was used as the anticoagulant and preservative. In order to determine the presence or absence of anemia in babies whose placentas had been drained, blood counts were taken on the first, second, seventh and thirteenth days and were found to be the same in 12 babies whose placentas had been drained as in 12 babies used as controls.

The average yield of blood was 80 c.c. which corresponds to about double this amount of adult blood. Fifteen cultures showed only 1 which was contaminated and this with *staphylococcus albus*. A change in the personnel of the delivery room resulted in 3 contaminated specimens out of 5 taken.

The authors believe that the sterility depends entirely upon the strict adherence to the technique described. The authors do not warm the blood routinely before administration since they believe over warming may account for temperature rises following the giving of the blood. In 25 transfusions, 1 severe reaction developed. Storage for over one month has resulted in minimal hemolysis.

THOMAS C. DOUGLASS, M.D.

#### LYMPH GLANDS AND LYMPHATIC VESSELS

Monteiro H. *Lymphangiography In Vivo. A Description of the Method, Results and Indications* (La lymphangiographie chez le vivant. Méthode, résultats et applications). *Bruxelles med* 1938 19 205 242

The substance used for the visualization of lymphatic vessels should meet the following require-

ments: (1) it should not be toxic; (2) it should not irritate the endothelium; (3) it should produce a considerable opacity; and (4) it should be able to penetrate the lymphatic reticulum. In spite of the fact that thorotrast has been condemned in the United States and France on account of its cancerogenic action, its radioactivity, its storage in the reticulo-endothelial system and its harmful effects on the hematopoiesis, the author employed the substance for visualization of the lymph vessels because only minimal doses were required. From 4 to 5 c.c. of the fluid are sufficient to produce an image of the iliofemoral vessels and the entire thoracic duct in dogs weighing from 10 to 15 kgm.

The technique employed was that described by Gerota for the visualization of lymph vessels in cadavers. The experiments were performed on guinea pigs, rabbits, cats and dogs. According to the site of the injection, the lymph vessels in various regions such as the neck, testicles and iliofemoral area could be demonstrated.

As Lenche showed the favorable influence of sympathectomy on the re-establishment of the arterial circulation, the author studied the question whether section of the sympathetic nerves has an identical influence on the re-establishment of the circulation of the lymph.

In a preliminary series of experiments the re-establishment of circulation after ligation or section of the lymph vessels was investigated. The method of lymphangiography clearly demonstrated the formation of new anastomoses or reconstruction of the severed vessels. The author was able to show that a sympathectomy facilitates the re-establishment of the lymph flow through the thoracic duct after its interruption. This effect is due to a larger number of anastomoses and improved nutritional conditions in the connective tissue.

In another series of experiments the re-establishment of the lymph circulation after the removal of glands was studied. A dilatation of the pre-existing lymph capillaries with a resulting insufficiency of the valves and a retrograde lymph flow could be demonstrated. Finally, the success of an autoplasmic transplantation of lymph glands in young animals could be clearly shown in lymphangiograms.

The method of lymphangiography can be supplemented by injection of a 4 per cent solution of indigo carmine into the lymph follicles or peripheral reticulum. In this manner the lymph vessels can be seen at operation.

Visualization of the lymph vessels should interest not only the anatomists and physiologists but also the clinicians, particularly students of cancer.

JOSEPH A. NARAT, M.D.

# SURGICAL TECHNIQUE

## OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Brandis H J von The Relationships Between Heat Economy and Surgical Intervention in Man (Ueber die Beziehungen zwischen Waerme haushalt und chirurgischem Eingriff beim Menschen) *Arch f klin Chir* 1938 192 245

This interesting article first treats of the general aspects of the chemical and physical regulation of heat. There is a difference between the heat produced by muscular activity and the absorption of food which is immediately lost and the chemical heat tonus concerning which there is no available information in man. Whereas the chemical regulation concerns the development of heat the physical regulation concerns the loss of heat. About 90 per cent of the loss of heat occurs through the skin and also through the lungs. Heat formation and loss are associated most intimately with the circulation, the metabolism and the nervous system. In regard to the latter there are supposed centers in the region of the medulla oblongata and in the midbrain and especially in the corpora quadrigemina and the tuber cinereum. During sleep the body temperature normally falls from 1 to 2 A.M., parallel with a measurable limitation of the basal metabolism. Von Brandis was able to confirm this. He was unable to determine however the changes in temperature in the skin observed by Ipsen and Kark, which occurred upon falling asleep or awakening. The onset of sleep is associated with a definite body heat.

In discussing the heat economy and surgical intervention the circulatory relationships and their changes as a result of anesthesia and surgical shock are explained but the relationships of the heat economy are not as yet. Starlinger, Rech, Voss, Watkins and Wilson have shown that with ether and chloroform anesthesia there is a fall in temperature whereas with local anesthesia there is usually a rise in temperature. Shortly after the onset of a general anesthesia Ipsen observed a rise in temperature in the skin of the soles of the feet which may persist up to ten days. This did not occur when the patient suffered injury by the surgical intervention. In patients who were followed up the mortality in the presence of abnormal temperature curve amounted to from 75 to 80 per cent. With local anesthesia the reports were contradictory.

However all the measurements taken heretofore are limited only to certain areas. The author, therefore undertook the taking of simultaneous measurements on large or different areas of the skin and the interior of the body. For this purpose he utilized thermo-electric thermometry and the recording with the Siemens six color recorder. A detailed description of the apparatus should be read in the original. The figures are not absolute ones but only the

variations in temperature under certain surgical conditions should be given. A definite agreement with shock temperatures taken with a mercury thermometer was noted to a great extent.

The temperature in healthy persons not operated upon was tested during a stay in bed while being transported on a carriage during and after the transport to the operating room and while on the operating table respectively. The temperature of the interior of the body is around 37 degrees C. The author's measurements confirm former findings. The temperature of the stomach was usually higher than that of the rectum but strict regularity was not the case. The temperature of the musculature may be higher than that of the rectum. The behavior of the temperature of the interior of the body is generally uniform in all areas in contrast to the temperature of the skin which is subject to very great variations for obvious reasons. The author found that in bed the temperature of the entire body averaged from 34 to 35 degrees C. and on the operating table there was a marked cooling at the periphery but not in the skin of the trunk. During transport the temperature was somewhere between the extremes. There was a striking constancy of the temperature of the face especially on the forehead. Psychic and mechanical factors may produce variations and pathological organic changes in the nerves and vessels responsible for the warmth of the skin in the affected portions of the skin produce variations.

The author made his own measurements on 79 surgical patients before, during, and after operation for ten days. The patients were divided into 2 groups: those that were and those that were not endangered by the operation. The author first considers the results in operations under general anesthesia in patients not endangered by the operation. About five to ten minutes after the anesthesia the temperature of the skin rises to its former level from wherever it had previously fallen during the transport and deposition of the patient on the operating table. However wherever it remained unchanged up to the time of the onset of the anesthesia namely on the trunk of the body and the face there was a slight cooling of from 0.5 to 1.5° C. It ran parallel to the temperature of the interior of the body. A special susceptibility was found on the hands and feet. The author confirms the view of Ipsen that this is a much surer sign of the actual onset of anesthesia than the loss of other reflexes. It may amount to from 10 to 12° C. and lasts from ten to twenty minutes. During the anesthesia this amounts to a few tenths of a degree and during the operation there is a slight cooling of the skin and interior of the body about 1.0 or 1.5° C. On awakening the temperature rises again and reaches its normal level after three or four hours. This process is explained by a decrease in the vegetative function during the

anesthesia and the operation. As a result of the anesthesia the normal balance between the vasoconstrictor and vasodilator stimuli is disturbed in favor of the latter. Ipsen considers a vasodilating stimulus as unlikely. This process is not the same in all the areas of the skin. The temperature of the subcutaneous tissue behaves like that of the skin. The temperature of the interior of the body cools off. On the return from the operating table there is a cooling of the skin of about 1 to 2 C. and in the interior of the body of about 0.3 to 0.6 degree. However this cooling is again corrected after thirty minutes.

After the operation there is a rise of temperature in the first three hours as a result of the recovery of the general metabolism and organic activity and the later temperatures are referable to the increased metabolism originating from the operative area. During the postoperative course the heat of the skin is strikingly resistant to external cooling for about eight or ten days. The author attributes this to the increase in the minute volume with a slightly increased or persistently the same amount of circulating blood in persons who have not been endangered by the operation (Rehn Clinic). This persistent elevation of the skin warmth has another cause than the increase in temperature at the beginning of the anesthesia for the skin cools off again if only an anesthesia and not an operation has been done. Interventions on the surface of the body have less effect upon the circulation and metabolism than those on the body cavities. Chloroform and avertin are more toxic than ether nitrous oxide gas or narkogen. However variations occur also in patients not endangered by an operation as in certain positions on the operating table and the feet remain cool in operation for hemorrhoids in the lithotomy position when they are elevated with excessive stimulation of peripheral reflex centers and in operations on the kidney. The consensual perfusion of symmetrical portions of the body also plays a rôle it is a nervous reflex process. The investigations carried out by the author seem to show that it acts differently under anesthesia. However this question must still remain open. Observations on a female patient with acrocyanosis in whom the stellate ganglion was removed give the author the right to assume that important tracts of the heat regulation are in the sympathetic ganglia and nerves and these are normally subdued during the anesthetic.

The author then discusses the regulation of heat in patients not endangered by operation under local anesthesia. The anesthesia causes relaxation while the operative intervention is a stimulus. This is evident under local anesthesia as the temperature in the interior of the body rises slowly toward the end of the operation or it undergoes no change at all whereas the temperature of the skin and subcutaneous tissue falls. One or two hours after the operation the temperature again becomes normal. What then is the origin of the temperature in the interior of the body? This was determined also by

Voss Starlinger Heindol and Loebell. In the first place it is psychic stimulation associated with muscular tensions and then a certain amount of heat stasis under the covers is also a cause. The author excludes the effects of novocaine adrenalin morphine and atropin. It is an interesting fact that neither pain a laparotomy a cystotomy, nor division of the arteries changes the heat economy. However there are exceptions as for example in the separation of the poles of the thyroid gland in thyroidectomy in which the author found a regular rise of the peripheral skin temperature and he attributes the increased hemorrhage from the skin to stimulation of the carotid sinus. Indeed this heating occurred from three to five minutes earlier in the arms. Furthermore he also observed this striking occurrence twice in Bassini herniotomies in which blood clots were sponged out with sponge holders from the posterior abdominal wall in the region of the roots of the mesentery and in brain tumor operations immediately after the splitting of the dura.

Under spinal anesthesia the heat formation in the anesthetic area is decreased that is the temperature of the skin increases on the legs whereas it remains normal in the remaining skin area. The temperature of the interior of the body however behaves exactly as under local anesthesia.

The heat economy and surgical intervention in patients endangered by an operation is then discussed. The author like Rehn differentiates shock as the sudden trauma (including also operative shock) from collapse the condition setting in later. However both conditions present failure of the vegetative functions with a high degree of acidification of the blood a marked diminution of the amount of circulating blood and a lowering of the minute volume. The peril from the operation may be produced by constitutional factors or by disease. Even though the picture of the heat economy shows a great diversity there is a sharp line of demarcation. The diminution of heat formation is more marked and of longer duration (from 2 to 3 degrees C. on an average as against 1.5 degrees C.). The final temperature is reached only after from six to eight hours. Ipsen calculates the operative mortality after the absence of the rise in temperature of the feet according to degrees mortality with 0 to 2 degrees C. 4.4 per cent 2 to 4 degrees 6.2 per cent 4 to 6 degrees 9.3 per cent and 6 to 8 degrees 0 per cent. Among 17 cases with deficient warming the author had a mortality of 6 (35 per cent). The curves also show how correct Rehn is with the differentiation between shock and collapse inasmuch as the shock disappears from five to eight hours after the operation. A subsequently renewed failure indicates collapse. Free transitions occur. There is an important parallel between the heat formation and the amount of the circulating blood. With a decrease in the latter there is a choking-off in the skin periphery without increased limitation of the heat production as long as compensation is not



possible. If the heat formation also is reduced then there is the greatest possible danger.

The effectiveness and ineffectiveness, respectively, of the circulatory stimulants, as well as of intravenous infusions, are similarly reflected in the curves of the heat economy. Veritol and the thyrotropic hormone also act no differently. Only an increased heat protection is effective here. The author then also mentions the favorable effect of the measures recommended by Karitzki in the onset of shock: heating with the light arc for twenty minutes with infusion of 1,000 ccm of Ringer's solution intramuscularly and 10 ccm of camphor. In this way a secretion of sweat with deacidification of the blood is produced. Whenever the secretion of sweat does not occur, severe organic changes are present. The findings of Karitzki are in direct contrast to the experimental experiences of Rein who observed the occurrence of collapse in exsanguinated and excessively cooled animals on the application of heat. However, the conditions in human beings who have been operated upon are different, inasmuch as the application of heat is supported by filling of the circulation and anaesthetics. The author does not discuss the effect of blood transfusion in shock upon the formation of heat. Many curves, tables and detailed histories are presented.

(FRANZ) LOUIS NEUWELT M D

#### ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Linberg B E. The Treatment of Non Penetrating Firearm Wounds of the Skin and Muscles. *New Surg Arch* (Russian) 1938, 163, 320.

All bullet wounds are primarily infected but from the clinical point of view penetrating bullet wounds may be considered as aseptic.

Rubber used for tourniquets cannot be preserved a long time, furthermore the intensity of the constriction cannot be well estimated. Therefore the author constructed a metal cylinder 13 cm long with a diameter of the oval cross section 2 by 3 cm. The cylinder contains two parallel longitudinal canals and a twisted twine 1 cm thick is introduced through one opening and carried back through the other so that a loop is formed. The twine may be replaced by a ribbon. The loop is placed around the injured extremity and a knot is tied with the ends of the twine protruding from the metal cylinder. The latter prevents damage of the skin. A towel or the patient's clothes are placed between the loop and the skin to prevent excessive constriction. The gadget can be sterilized, is indestructible, and allows modifications of the constriction in the course of the operation. For instance the pressure may be released temporarily to facilitate the finding of severed blood vessels after amputation.

If the wound is seen during the first few hours after the injury, if the anatomical conditions are suitable and if sepsis and qualified surgeons are available, complete excision and primary suture are

recommended. This procedure is usually successful in 90 per cent of the cases. If the patient is seen from eight to twenty four hours after the injury a partial debridement and placing of untied sutures are followed by a rapid cicatrization in approximately 60 per cent of the cases. The sutures are placed but not tied until from three to five days later. If the patient comes under observation twenty four hours or more after the injury, the author recommends a toilet of the wound and irrigation with Dakin's solution, potassium permanganate (1:2,000), chlorazide, or an alcoholic solution of iodine (1:1,000). In this group a secondary suturing is successful in about 90 per cent of the cases.

To prevent absorption of infectious material and to create a lymph flow toward the wound, a 5 to 10 per cent solution of gelatin or gum acacia, or alcohol compresses may be applied. Some authors recommend the use of sodium chloride tablets or sugar to create hyperosmotic conditions.

Severely infected wounds are treated by the author with compresses saturated with such solutions as hot potassium permanganate and rivanol. If the wound is dry hypertonic saline solutions are applied. If the healing course is favorable ointments are used, while excessive granulations are treated with various powders. This treatment is supplemented by fractional blood transfusions and the administration of calcium. JOSEPH K. NARAT M D

Gautier J. The Treatment of Burns with Infra-Red Rays (Traitement des brûlures par les rayons infra rouges). *Presse med* Par 1939 47, 139.

The general symptoms developing after severe burns bear a striking resemblance to the condition aptly designated by Leriche as "postoperative disease." It is for this reason that the author advocates the use of infra red rays in the treatment of severe burns. For the past two years the author has operated under continuous infra red irradiation combined with a terminal ultraviolet irradiation. The marked change in the postoperative condition and the analgesia thus obtained, encouraged him to try its effect in burns. This method has enabled him to cure without pain, without dressings and more rapidly than with tannic acid. In the beginning he used both infra red and ultraviolet rays, but later he used infra red rays exclusively. He reports in detail 3 successfully treated cases and 1 case in which treatment did not save the patient, probably because it was instituted too late, other methods having been tried first and other complications had developed. Early application of the rays is an essential for success and once the lesions have become infected the treatment is of little avail. However, the irradiation may be used following other treatments such as picric acid. Irradiation should be begun while the lesions are being cleaned. After from one half to three quarters of an hour of irradiation, the pain will begin to subside and no sedatives or analgesics will be needed. The patients sleep comfortably during the first night.

After each sitting of one hour the patient is returned to bed without dressings under a sterile screen surrounded with electric lamps to prevent chilling if necessary. Immediately after the first irradiation the oozing is markedly diminished and after the third or fourth sitting the lesions are covered with a crust which furthers epidermization in the same manner as that produced by tannic acid. The wound dries up rapidly in proportion to the frequency of the sittings within a given period. For this reason the author recommends two sittings of one hour each daily, this dosage also serving to maintain analgesia and diminish shock. In patients who have not been traumatized a thin crust forms but in regions exposed to irritation as the back for instance a thicker crust forms. Nevertheless cicatrization is perfect. The crusts may fall off their own accord if not a moist compress is applied on the sixth day or a little later. Thus cure is obtained by the sixth or eighth day except in the most severe burns which may require twenty days.

In burns involving the folds of the joint regions the limb may be held in slight flexion. This should be corrected for even if extension breaks or cracks the crust which has formed it will readily reform in the correct position. Lambret has recently emphasized the favorable effect of infra red rays on the humoral syndrome of extensive burns as has been observed also in postoperative conditions. These rays have also an anti infectious action. Suppuration did not develop in any of the cases treated. Of course a more extensive burn will require more prolonged treatment than one of small extent. Epidermization following this treatment is perfect in second degree burns and to a less extent also in third degree burns. The scars are smooth and elastic.

EDITH SCHAEFER MOORE

Callander C L, Haim A and Maximov A. Gas Gangrene. An Analysis of 109 Cases Encountered in Civil Practice. *Am J Surg* 1938 42 811

Gas gangrene occurs far more frequently than is commonly supposed especially in localities having active emergency services. From the high death rate the inference is drawn that early recognition and proper treatment are frequently lacking. Sufficient stress has not been placed on the bacteriology of the condition and it is thought that closer cooperation between the surgeon and the bacteriologist will result in progress in the treatment of the disease.

It is unusual to find a single anaerobic infection in a case of gas gangrene usually there is more than one strain of anaerobe present and not infrequently aerobes which complicate the picture and produce favorable conditions for the multiplication of anaerobes. The clostridia most commonly cultured in cases of gas gangrene are (1) *Clostridium welchii* (*Bacillus aerogenes capsulatus*, *Bacillus perfringens*) (2) *Clostridium edematis maligni* (*Vibrio septique*) *Clostridium novyi*, *Clostridium edematis*, *Clostridium*

*sordelli* and *Clostridium histolyticum*. These organisms are of exceedingly wide spread distribution. The spores are likely to persist indefinitely on anything that can be contaminated by dust or dirt. It is impossible to differentiate the members of the group on a morphological basis and the cultural isolation usually takes too long to be of practical clinical use. One of the interesting features of experimental gas gangrene infection is that the anaerobes are absolutely harmless unless they are in combination with their toxic metabolic products or are allowed to form these products in necrotic or crushed tissue. In the human laceration and crushing of tissues effusions of blood interference with circulation fractures and foreign bodies are all predisposing factors which create local conditions favorable for the growth of anaerobes. Not only does the toxin of one species of anaerobe favor the growth of other species but an aerobic infection associated with anaerobic infections also produces more favorable conditions for the growth of anaerobes. An interesting observation is made in that granulation tissue although often exposed to anaerobes never permits their growth.

In addition to the disease occurring in crushing and lacerating injuries it is more likely to occur in injuries to the gluteal and perineal regions or following a clean amputation through relatively avascular tissues. Cases of gas gangrene have occurred from hypodermic and intramuscular injection. The evidence in these postinjection cases seems to indicate that the spores are not necessarily introduced but that spores probably lie latent in healthy tissues especially in the aged. Experimental evidence seems to confirm this conclusion.

The pathological changes of swelling and necrosis in the muscles are described. These changes result from the powerful exotoxin liberated. Bubbles of gas travel within fascial planes and vasculoneural bundles but may rupture and rapidly spread. Microscopically there is a striking absence of inflammatory reaction.

The local manifestations are much more important for an early diagnosis than the general manifestations of fever and pain. Swelling reddened wound edges serous and serosanguinous exudate and gas bubbles as shown by x rays are much more reliable clinical findings and should indicate smear and culture tests of the exudate from the depths of the wound. Any wound which shows large graniprimitive rods should be suspected of harboring a possible gas gangrene infection. Cultures in meat or brain broth may be helpful.

The prognosis depends upon the duration and severity of the infection. In this series of 109 cases the death rate was 51 per cent. Infection in the lower extremities resulted in a much higher death rate than that in the upper extremities.

The prophylactic treatment consists of the debridement of all lacerated wounds compound fractures and gun shot wounds. Smears and cultures from these wounds should be made at the

slightest suspicion of trouble. The prophylactic use of serum is still experimental. If serum is given prophylactically a full therapeutic dose should be given subcutaneously; it should consist of

- 10 000 units Welch antitoxin
- 10 000 units edematis maligni antitoxin
- 200 units novvi antitoxin
- 200 units sordelli antitoxin
- 25 units histolyticus antitoxin

If the disease develops, wide incisions should be made longitudinally in the affected areas. Irrigations with Dakin's or Pilcher's solution are also recommended. Polyvalent serum should be given intravenously in large amounts (100 000 to 150 000 units). Oxygen inhalations and supportive measures are helpful. The use of x rays and sulfanilamide appears to be of some value, but is still in the experimental stage. If gas gangrene persists amputation must be performed. It is best to avoid muscles if possible and incise only through tendons. A tenoplastic amputation through the knee joint is described.

LUTHER H. WOLFF, M.D.

#### SURGICAL INSTRUMENTS AND APPARATUS

Pickrell, L. L. Studies on Hypersensitivity to Catgut as a Factor in Wound Disruption. *Bull. Johns Hopkins Hosp.* Balt. 1939, 64, 195.

The author found it impossible in his experiments to sensitize either guinea pigs or rabbits to commer-

cial catgut or to an extract from catgut. No evidence of either local sensitivity or general reactions could be elicited in guinea pigs or rabbits subjected to the previous absorption of catgut. It was not possible by means of the intravenous injection of this material, to produce anaphylactic shock in guinea pigs that had been previously treated with either catgut or catgut extract. Serological tests for antibody production in animals treated with catgut were negative.

No wound disruptions occurred in either rabbits or guinea pigs which had been previously treated with catgut when proper aseptic precautions were used. Although catgut implanted intradermally in both rabbits and guinea pigs caused an inflammatory response, the leucocytic emigration was no greater in these animals than in those which had been treated previously with catgut or its extract.

In the human being no evidence of sensitivity could be demonstrated following the disruption of 3 surgical incisions that had been closed with catgut. In 100 clinical cases in which catgut had been used tests for sensitivity to catgut extract were carried out pre-operatively and then one month following operation. In no case was sensitivity demonstrable. The author concludes that although catgut like any other suture material acts as a foreign body and causes slight leucocytic response, it does not act as an antigen to induce the hypersensitive state.

JACOB M. MORA, M.D.

# PHYSICO-CHEMICAL METHODS IN SURGERY

## ROENTGENOLOGY

Brailsford J F Simple Radiographic Methods for the Localization of Foreign Bodies *Br J Radiol* 1939 12 63

The routine procedure used by the author is anteroposterior radiography of the extremity with a metal pointer resting on the x ray film and pointing to the wound. This permits the estimation of the relative position of any foreign body which may be present at the wound in this plane. Over the site where the foreign body is situated metal markers of iron wire such as are illustrated in Figure 1 are fastened to the skin with adhesive plaster. The extremity is now placed in the position it will assume during the operation and anteroposterior and lateral films are taken with the tube centered over the metal markers. These radiograms will give an accurate estimate of the position of the foreign body relative to the markers as illustrated in Figure 2. Under that portion of the marker which is shown by the radiogram to overlie the foreign body a small cross is made and the adhesive tape and marker are removed. The author finds that the cross is best made with a sharp scalpel followed by the immediate painting over with iodine.

When the foreign body is situated in the pine pelvis hip or shoulder joint and an estimate of its depth and relation to bony structures cannot be determined from anteroposterior and lateral radiograms the author uses a modification of the method of Mackenzie Davidson. In this method two exposures are made on one film the tube at a known height from the film is shifted a known distance between the exposures. A metal marker is attached to the skin before the exposures are made. A double image is thus obtained. The distance between any two shadows of the same point in an object can be measured on the film by compasses and the accurate depth from the skin can be readily determined by the use of a scale illustrated in Figure 3.

On the line AB the distance of the focal spot of the x ray tube from the film is measured a distance of 15 to 20 in being optimum. The vertical line AC represents the tube shift between the two exposures 6 cm being a good standard. On the vertical line drawn at D the distance between the two identical points of the image of the foreign body is measured by compasses and is here represented as DF. If a thread is drawn taut between C and F it will cross



Fig 1



Fig 2

Fig 1 Design of wire marker to be affixed to the skin over the site of a foreign body

Fig 2 Radiogram of a round shrapnel bullet in the thigh showing method of locating foreign body with the aid of four markers. Patient fixed in the position for operation

AB and the distance of the point at which it crosses which is here represented as  $\lambda$  from the point D is the depth of that point of the foreign body from the film surface. If now the measurement between the shadows of a point on the metal marker affixed to the upper surface of the skin is made its depth from the film surface can readily be determined and from these two measurements the distance of the foreign body from the metal marker is obtained by subtraction. In a like manner the respective depth from bony outlines can also be obtained. The radiologist's report should state in addition to the depth of the foreign body its relationship to any important anatomical landmarks which the surgeon will encounter or be guided by at the operation.

In the case of superficial foreign bodies in which there is frequently a hard nodule under the skin a metal marker is fastened over the nodule and a double radiogram taken. Localization may be made in a manner similar to that above described.

For the injection of sinus tracts the author uses a mixture of 25 per cent bismuth carbonate in a saline. This mixture is drawn into a large 50 c.c. syringe when warm and is then allowed to cool. The form of a core in which the opaque material leaves the syringe is of material assistance in outlining the sinus.

In conclusion the importance of early radiography and quick detection of gas gangrene is stressed.

HAROLD C OCHSNER M.D.

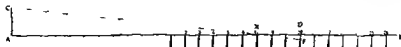


Fig 3

Blady J V and Hocker A F The Application of Sialography in Non Neoplastic Diseases of the Parotid Gland *Radiology*, 1939 32 131

The roentgen visualization of salivary glands after injection of lipiodol into their ducts has made possible a definite advance in the study of diseases of these organs. This paper is based upon observations made in connection with 38 cases of non neoplastic diseases of the parotid gland. These cases are tabulated as to their nature. In each the clinical, the histological (whenever available) and the roentgenographic findings have been correlated. The technique of injection and examination is briefly described and the various conditions discussed are illustrated.

In inflammatory lesions the roentgen appearance depends upon the degree of changes resulting from the infection. In acute cases, a distention or beading (or both) of the ducts usually occurs and small alveolar dilatations are noted in the gland. Later large cystic dilatations may form from coalescence of the cavities. Chronic recurrent parotitis may show changes similar to those observed in acute cases. In epidemic parotitis and in milary abscesses following streptococcal and typhoid septicemias identical roentgen changes have been reported.

Obstructions of Steno's duct due to calculi, stricture, or extrinsic pressure also produce characteristic changes demonstrable by sialography. With calculi, a filling defect or point of obstruction may be shown with dilatation of the duct proximal to the obstruction. These findings are especially valuable when the calculus itself is not visible on plain roentgenograms. A stricture or stenosis of Steno's duct is generally easily recognized by means of a lipiodol injection. When there is only partial obstruction, dilatation of the duct proximal to the narrowing may be demonstrated. Compression obstructions may be revealed by narrowing of the lumen or displacement with proximal dilatation of the duct system.

Parotid fistulas are readily demonstrated by sialography. The duct system and the point of origin as well as the ramifications of the sinus tract are clearly revealed by the injected lipiodol.

In xerostomia the entire duct system, and especially Steno's duct, has a much smaller lumen than is normally seen. The injection of a minimal amount of lipiodol results in diffusion of the opaque media into the gland parenchyma.

Examination of a case of Mikulicz disease revealed a normal duct system but a low threshold tolerance for lipiodol as 1.25 cc readily diffused through out the gland substance.

Extraparotid disease simulating lesions within the gland may readily be differentiated as with the aid of sialography a normal duct system is revealed. This may be of considerable value in connection with treatment in doubtful cases. In connection with trauma or operative procedures, valuable information may be derived from sialographic studies relative to either Steno's duct or the parotid gland.

ADOLPH HARTUNG, M D

Mulsow, J E Roentgenological Study of the Hypopharynx Larynx and Trachea Its Use in Laryngeal Diagnosis *Arch Otolaryngol*, 1939, 29 326

This paper is largely a review of the roentgen findings reported by various authors in connection with the normal larynx and pathological conditions such as carcinoma, tuberculosis, syphilis and paralysis of the vocal cords. Brief references to personal investigations are made and the technique used in the studies is described. In the author's summary it is stated that conclusive diagnostic information may frequently be obtained by roentgenological study and that the latter is of especial value and importance when indirect or direct complete inspection of the larynx is difficult or impossible.

ADOLPH HARTUNG, M D

Anspach, W E Bronchiectasis Collapsed Lung, and the Triangular Basal Shadow in the Roentgenogram Their Interrelationship *Am J Roentgenol* 1939 41 173

Recent investigations based both on necropsy findings and on observations of the etiology, nature, and ultimate fate of the triangular shadows at the base of the lungs revealed in roentgenograms of the living over long periods of time, have pointed out a very definite interrelationship between bronchiectasis, collapsed lung and these shadows. The author has found such shadows in approximately 1 per cent of several thousand pulmonary roentgenograms of children examined and in cases which came to necropsy, it seems evident that atelectasis due either to an obstruction of the main bronchus to a lower lobe, or of many fine bronchi usually of the second and third divisions, accounts for the triangular shadow, and under certain conditions is a precursor and not merely an associated finding of bronchiectasis.

The triangular basal shadow usually makes its first appearance in early childhood in the course of what is commonly diagnosed as a lower lobe pneumonia. It persists after the acute symptoms of the infection have subsided and after several months bronchial dilatations within it can be demonstrated with the aid of injections of iodized oil. If the triangular shadow shows marked fluctuations in size and density from one examination to the next, which start shortly after the acute symptoms of pneumonia, clearing finally occurs without the development of bronchiectasis or with the development of tubular dilatations only. Patients in whom the size and density of the triangular shadows fail to fluctuate over long periods develop saccular bronchiectasis.

Necropsy findings tending to confirm the clinical observations are described and the pathogenesis is correlated with these findings. Attention is called to the fact that bronchoscopic aspiration is of definite benefit and disappearance of the triangular density may follow in a short time or the shadow may become fluctuating and eventually leave few residual changes.

ADOLPH HARTUNG, M D

**Benassi E** Does Hepatosplenography with Thorium Dioxide Deserve to be Completely Abandoned? (L'epatosplenografia col biossido di torio merita di venire completamente abbandonata?) *Radiol med* 1939 26 81

On the basis of his latest observations and of the literature which however is scarce and in general not very favorably inclined toward hepatosplenography with thorium dioxide Benassi thinks that the prudent but not pessimistic conclusions which he drew in 1934 are still valid now. The elimination of thorium dioxide is so slow that the histiocytary impregnation by this opaque substance must be considered as permanent for practical purposes consequently this substance should not be used too indiscriminately and should be reserved for cases in which a real and useful diagnostic response can be expected. It is evident that in consideration of the protracted presence of thorium in the organism and of its radioactivity even if it is only slight the possibility of eventual damage to the organism cannot be excluded with certainty. Undoubtedly the tissues react to the impregnation with changes which may be in part irreversible but up to the present time no clinical observation has been presented which allows acceptance of a veritable damaging action by thorium dioxide on the healthy organism or during the course of any disease. The only legitimate but hitherto completely hypothetical reservation that can be made concerns the possibility of very late damaging effects caused by the radioactivity of thorium but these fears are much allayed by the weakness of the radiating action of the substance and by the negative results of the observations which have already extended over several years.

The usefulness of hepatosplenography resides in the reliable demonstration of the size of the liver and the spleen and although the thorium dioxide method has not fulfilled all the hopes that were based on it complete rejection is not justified because there are cases in which it is of great diagnostic usefulness and in which it should be used without excessive fears. Its principal indications are the necessity of knowing the form and position of the liver or the spleen in order to solve an important diagnostic or therapeutic problem (especially in the differential diagnosis of tumors of the hypochondrium) the necessity of obtaining information as to the presence or absence of hepatic tumoral metastases in order to establish the eventual indication of surgical intervention on other organs or to make a diagnosis the well founded suspicion of the presence of a hepatic abscess or cyst the diagnosis of which cannot be made in any other way the study of the gravity and of the course of special cases of cirrhosis of the liver the opportunity of following step by step the changes of the liver or the spleen or disorders located in their interior with regard to their morbid evolution and their treatment.

Lately a new hepatosplenographic method has been reported by Berg the substance used is an

iodine salt containing 50 per cent of opaque substance and 20 per cent of iodine. The particles of opaque substance have the size of 1 micron. The dose employed is from 200 to 250 mgm per kgm of body weight and is administered in one slow injection. There are no symptoms of iodism and roentgen visualization of the liver spleen gall bladder kidneys and urinary passages is obtained. Elimination is rapid.

RICHARD KEMEL MD

**Pendergrass E P Hodes P J and Garrahan C J** Roentgen Therapy by the Method of Chaoul *Radiology* 1939 33 142

The Chaoul method of roentgen therapy consists of contact or near contact application of low voltage (45 to 60 kv.) rays. Modern shock proof equipment and improved tube construction have made much irradiation feasible and experience has demonstrated certain advantages of its use.

The high tension generator tube and cooling device used are described briefly. Physical data relating to the use of the method are discussed at some length. These include the dosimeter intensity of radiation quality of radiation as expressed by the half value layer focal spot radial variations in intensity variation of intensity with distance back scatter and depth dose. A number of graphs are included to illustrate practical aspects of some of the physical data.

The authors' clinical application of the method has extended over a period of eighteen months during which time 80 cases were treated including both benign and malignant lesions. As regards dosage the daily dose per field has varied from 100 to 400 roentgens in air. In some instances as many as 3 000 roentgens have been delivered at one sitting without injurious results. In the majority of cases from 400 to 450 roentgens given at one time produced a threshold erythema. Doses as high as 9 000 roentgens have been given over a period of twenty five days to one portal with no ill effects. The authors' experiences with skin reactions and subsequent repair have been similar to those described by others. The reactions varied with the doses given and invariably were followed by prompt healing without untoward secondary skin changes.

Among the benign conditions treated an angiomas warts leucoids vernal catarrh pruritus anal rectal condylomas and infections are discussed both as to results and the technique used. Practically all of these lesions showed favorable responses. Treatment of malignant neoplasms was limited almost entirely to lesions of the skin lips and easily accessible portions of the mouth. Approximately 30 such cases were subjected to this form of treatment with very satisfactory results. Two failures occurred in advanced lesions in which superficial healing took place but the deeper portions were unaffected. Attention is called to limitations of the method in connection with deep seated lesions those which are not readily accessible or those which are very extensive.

In view of the brief period of experience with the method of Chaoul no attempt is made to draw any definite conclusions. In summarizing their observations the authors state that low voltage therapy (Chaoul technique) is indicated as a procedure of choice in lesions so situated that short treatments are desirable. It is a satisfactory therapeutic procedure in selected cases in which it is desirable to obtain the maximum amount of effect in the superficial tissues.

ADOLPH HARTUNG M.D.

**Gilbert R. Radiotherapy in Hodgkin's Disease (Malignant Granulomatosis): Anatomical and Clinical Foundations Governing Principles Results** *Am J Roentgenol* 1939 41: 198

This is a detailed report on Hodgkin's disease which is backed by a large personal experience of seventeen years and is divided into two parts. Part I deals with the anatomical and clinical features the evolutionary aspects and the diagnosis of the disease and Part II deals with the various treatment angles especially the value of roentgen therapy.

The following general conclusions are drawn:

1. Because of the high degree of radiosensitivity of essentially lymphoid elements of Hodgkin's disease systematic roentgen therapy is the treatment of choice.

2. Diagnosis should be made early and whenever possible by biopsy.

3. The roentgen therapist must act as a clinician and track the disease in all its haunts.

4. The effect of the irradiation is direct and destructive (cytolytic); it is followed by fibrosis which enhances the spontaneous process often observed when the disease is allowed to go untreated.

5. The aim of treatment is to obtain as frank and as long remissions as possible; therefore irradiation must include the methodical destruction of all granulomatous foci without however jeopardizing the general condition of the patient or influencing the blood picture too unfavorably.

6. Segmental roentgen therapy satisfies the above requirements; best panteleroentgen therapy seems contraindicated. The irradiation is carried out with from 170 to 200 kV, 1 mm of copper and 1 mm of aluminum for screening large fields up to 400 sq cm and from 35 to 60 cm skin target distance. An incident dose up to 250 roentgens on the skin is given to each invaded region in succession until a minimal total depth dose of 500 roentgens is reached on the focus; the duration of the series being about five weeks.

7. If a large tumor has not completely disappeared the irradiation may be repeated in six weeks or later whenever a recurrence develops. Prophylactic or maintenance roentgen therapy is superfluous and, through its effect on the blood, even detrimental.

8. The roentgen therapy apart from palliative relief produces prolongation of the average duration of the disease and, in a smaller number of cases, leads to long term survivals. An extensive statistical survey made by the author revealed that the average life span in cases of Hodgkin's disease has been increased from a minimum of one year and four months to a maximum of four years and six months and that in certain instances (author's cases) as many as 34.3 per cent of the patients treated have surpassed the five year period.

A bibliography of 258 articles is appended.

TRAJAN LEUCUTIA M.D.



## MISCELLANEOUS

### CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

John H J Surgery and Diabetes *Ann Surg* 1918  
109 1052

Since the use of insulin in the care of diabetic patients the surgical mortality rates in this type of case have decreased tremendously. An average of a series of 1,677 cases reported before the advent of insulin showed a mortality rate of 20.6 per cent while in 9,513 cases reported since 1923 the mortality has been only 6.7 per cent. There are still tremendous variations in the results reported. These range from 2.2 to 6.8 per cent.

Surgery in diabetic patients carries a greater than normal risk not because of the diabetes *per se* but because of obesity, arteriosclerosis, advanced age and the dangers of infection.

Cholecystitis is common among diabetic patients and the removal of the gall bladder usually improves the diabetic condition.

Surgery of the extremities for gangrene is a special problem encountered in diabetes. The best treatment for gangrene is prevention since the mortality rate in this type of operation is necessarily high because of the advanced age of the patients and the shock occasioned by amputation.

The proper care of a diabetic patient who has an operation demands the combined services of an internist and surgeon who are interested in the disease. The best results are obtained where there is the best team work.

The most important diagnostic problems encountered in connection with surgery on diabetic patients are (1) the differentiation between acute appendicitis and diabetic acidosis and (2) the proper diagnosis of unconsciousness which may appear following an operation. The latter may be caused by surgical shock, diabetic coma, hypoglycemia or alkalosis. The history and blood chemistry findings are important in making the differentiation from acute appendicitis.

Except in situations that present an emergency a diabetic patient should be subjected to thorough study before any surgical procedure is attempted. The proper dosage and distribution of insulin must be determined if the diabetic condition is to be kept under control satisfactorily after the operation.

The choice of anesthetic is very important. Chloroform should never be used either has a great many hazards. The anesthetics of choice when local or spinal anesthesia cannot be used are nitrous oxide, ethylene and cyclopropane.

After an operation the condition of the diabetic patient must be followed most carefully with repeated determinations of the blood sugar and adjustment of the insulin dosage so that both hyperglycemia and hypoglycemia may be prevented.

Intravenous administration of glucose solutions may be resorted to provided the injections are accompanied by appropriate doses of insulin.

SAMUEL KARN, M.D.

Uihlein A. Jr. The Use of Cutis Graft in Plastic Operations *Arch Surg* 1930 38 218

Few reports of conclusive experimental or clinical studies with the cutis graft which is so easily available have appeared with the exception of those published in the German literature.

Since 1928 Rehn has used cutis in various operative procedures and applied the principles derived from his experimental findings in dogs to the plastic repair of human tissues. The results in the cases were so encouraging that gradually the field of application has been broadened. In the article of which this is an abridgment some of the experiments which led up to the clinical application of the results are briefly outlined. The outline is followed by a description of the operative procedures and by an analysis of the results obtained in the 104 cases in which plastic operations with cutis have been performed in Rehn's clinic.

Cutis contains all the components of skin except the epidermis. It is inherently active. It is composed of a network of connective tissue fibers. Owing to the stimulus set up by the tension under which the graft must be sewn, these inherent factors assist in the metamorphosis and metaplasia of the graft. The inherent activity of cutis in contradistinction to fascia which is inactive, accelerates repair by encouraging migration of cellular elements.

Eitel with the Warburg technique showed that cutis is more active and lives longer than fascia. Schneider showed that cutis is an excellent material for transplantation because of its content of glutathione.

Rehn's first clinical application was in the repair of large postoperative abdominal hernias. Sixty-five patients with this type of hernia were operated upon by him with encouraging results. Sixteen patients failed to appear for re-examination. Of the remaining 49, 6 presented recurrences from two to nine years after the cutis repair.

The transplant is usually taken from the lateral aspect of the thigh. This area is cleansed prior to operation according to the technique described in the original article. In some cases Rehn has employed the skin of the abdominal wall as the transplant. No iodine should be used in preparing the area from which the cutis is to be taken. For obtaining the graft the epidermis is first removed by the Thiersch method. From this epidermis-free area an oval piece of cutis of the desired size is excised. One centimeter of fatty tissue is included. The wound that is left in the thigh is easily closed with silk sutures.



After assuring adequate hemostasis in the area to which the graft is to be sewn the cutis is placed over the defect and sutured to the generously exposed muscles and fascia. The transplant is then sutured under tension with chromic catgut to these healthy tissues so that it resembles a taut drumhead after all the ligatures have been securely placed. The skin and subcutaneous tissues of the wound are then easily approximated and closed over the graft in the usual manner.

The unexpected return of two patients upon whom a cutis operation had been performed four years previously afforded histological proof of the activity and the resulting metamorphosis of the cutis transplant. The pieces of tissue removed from the area of the transplant presented normal connective tissue characteristics. The abundant vascularity of the tissue was striking. No epidermal remnant of the original cutis graft and no cystic portions could be identified in the sections.

Repair of recurrent inguinal hernia with the cutis graft was made in 11 cases. In 3 of the patients the hernia recurred after the repair. In the others evidence of recurrence did not develop until from two to six years after the operation. Frank reviewed these cases in a recent paper.

The operative repair with a cutis transplant of a knee joint in which lateral motion was excessive has been an interesting step in the treatment of this disability. The cutis graft is a functional equivalent of the weakened ligamentous supports. Rehn exposes the lateral or medial muscle groups above and below the knee through separate incisions. The transplant is sutured to these muscles as described in the original article under tension with the knee slightly flexed. At the close of the operation the leg is placed in extension in a plaster cast for a period of weeks. Bright patients with excessive lateral motion of the knee joint have been operated upon in the clinic in this manner. Good functional results were obtained in 6 of these.

A complete analysis of the cases in which the cutis transplant was employed with an analysis of the postoperative results can be found in the original article.

Anesthesia must be sufficiently deep to assure complete relaxation of the muscles so that the necessary degree of tension for stimulating metaplasia is sustained after the anesthesia wears off. Spinal and intravenous anesthesia have been tried but either given by the open drop method has allowed better relaxation.

Wound infection and hematoma comprise the principal early postoperative complications. Wound infection developed in 15 of the 104 cases in which the cutis graft was employed and hematoma resulted in 5. In 9 of the 15 patients there was good healing in spite of the infective process and recurrence of the pre-operative symptoms was not observed. Rehn attributes the lack of serious complications from infections to the inherent activity of the cutis graft.

#### Gage M Pilonidal Sinus Sacrococcygeal Ectodermal Cysts and Sinuses *Ann Surg* 1939 109 297

Pilonidal sinuses and cysts are of common occurrence. They are derived from that part of the caudal end of the medullary canal located in the tail of the anlage. They are divisible into four groups: (1) sacrococcygeal dimple and sacrococcygeal dimple sinus; (2) true pilonidal sinus confined to the subcutaneous tissue; (3) true

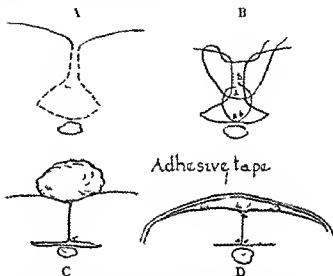


Fig. 1 Drawing (exaggerated) illustrating the defect following removal of a pilonidal sinus with minimum amount of tissue destruction (A) the sutures used to close the defect (B) subcutaneous defect after suturing (C) and the obliteration of all dead space and approximation of all wound surfaces by sea sponge pressure (D)

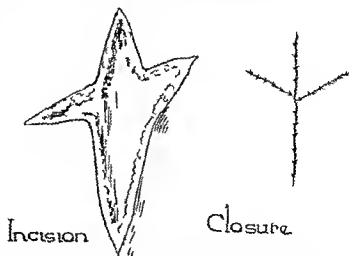


Fig. 2 Drawing illustrating the method of excising the primary pilonidal sinus and the lateral or secondary sinuses and the wound after closure. (Courtesy of J. B. Lippincott Co.)

pilonidal sinus extending into the sacral canal and (4) true pilonidal sinus continuous with the subarachnoid space and canal of the spinal cord.

Complete surgical extirpation of the primary sinuses and cysts as well as of the secondary sinuses and primary closure of the wound is the ideal treatment. Complete apposition of all wound surfaces and obliteration of all dead spaces by pressure with a sea sponge must be obtained to get the best results. With this method 42 cases were treated by the author without a single recurrence.

CHARLES HAXON, M.D.

Moulounguet P, Bacly G and Dobkevitch S.  
Periosteal Lipoma (Lipomes périostés). *Rev de chir. Par* 1939 38 1

The authors report a case of periosteal lipoma in a man sixty years of age in whom a swelling developed just above the knee on the left thigh following an injury at that site from the kick of a horse. Operation was done and the tumor removed. The tumor involved the periosteum but was implanted directly on the bone. The base of implantation was adult bone with a fatty marrow. Strips of newly formed bone with hematopoietic marrow had invaded the body of the tumor which was a lipoma. The patient made a good recovery and several months later there was no sign of recurrence and the patient was able to work.

Lipomas of the periosteum are of rare occurrence and those that are attached to the bone or show any infiltration of the bone as in the authors' case are very unusual. Such tumors may result from trauma or from chronic irritation. In the authors' case there were no muscular fibers in the tumor tissue. Periosteal lipomas observed in children which were probably congenital and which showed the histological characteristics of fibrolipomas have been reported.

ALICE M. MEYERS

Grech E M H. Carcinogenic and Related Non-Carcinogenic Hydrocarbons in Tissue Culture.  
*Am J Cancer* 1939 35 195

Many chemically pure substances have been shown to cause cancer when injected or applied to the skin of animals. Little is known however concerning the manner in which these substances act on the cell.

Several workers have attempted to study the action of carcinogenic substance *in vitro*. Des Lagniers is the only one who has reported the successful induction of malignancy in this manner. Of 6 fowls injected with tissue which had been treated with 1:5:6 dibenzanthracene *in vitro* 1 is said to have developed a myxosarcoma at the site of injection.

The author's experiments were begun in the hope that a combination of the most advanced cytological technique and tissue culture might throw some light on the nature of the effect of these carcinogenic substances on the cell itself. Fibroblasts from the connective tissue surrounding the ribs of embryonic mice were used. The tissue was grown by the hanging drop method in a medium consisting of fowl plasma and an extract of nine or ten day old chick embryo in Pannett and Compton's solution. The

substances to be tested were dissolved in the solution and buffered at a pH from 7.4 to 7.5.

When added to mouse fibroblasts in tissue cultures 1:2:5:6 dibenzanthracene choleic acid caused an increase in cell proliferation as compared with the controls which included cultures treated with phenanthrene choleic acid, acenaphthene choleic acid, desoxycholeic acid and untreated cultures. Desoxycholeic acid and phenanthrene choleic acid were found to give a decrease in cell proliferation. The increase in the outgrowth of cultures containing 1:2:5:6 dibenzanthracene choleic acid over that of the untreated controls was approximately 50 per cent.

The chromosomes showed a precocious splitting in the prophase in the cultures treated with 1:2:5:6 dibenzanthracene choleic acid, 20 methylcholanthrene acid and methylcholanthrene in serum but not in any of the four types of controls.

Simultaneously to mitosis (reduction division) were occasionally found in cultures treated with 1:2:5:6 dibenzanthracene and methylcholanthrene choleic acid in which the metaphase chromosomes were lying closely in pairs, the members of these pairs separated later to opposite poles which resulted in a reduction division and in the node and loop formation of the chromosomes.

During preliminary tests it was found that ether even in very slight amounts was toxic to the cultures and produced nuclear changes of a lethal nature. These changes consisted chiefly of chromosome clumping, lagging at the anaphase, failure of the cell to divide and unequal division. These observations would suggest that certain types of lethal abnormalities of the nucleus found in tumors may be due to the toxicity of the environment in which they develop.

JOSEPH K. NARAT, M.D.

Gray J H. The Relation of Lymphatic Vessels to the Spread of Cancer. *Brit J Surg* 1939 26 462

For this investigation the author employed India ink and gelatin mixtures for the blood vessels and thorotrast for the lymphatics. Warm skin taken immediately after removal at operation or skin removed at post mortem and subsequently heated in a bath to body temperature is suitable but whatever tissue is used it must not be touched by fixatives before the injection and it must be as fresh as possible. A total of 24 specimens presenting new growths was used for the experiments. All of these were removed at operation so that none of the cases could be said to be inoperable.

The deductions from these investigations may be summarized as follows: the mode of spread of cancer to lymph glands is generally by means of lymphatic emboli of cancer cells carried along in the lymph stream. The results indicate that cancer of its own accord does not generally stimulate a new formation of lymphatic vessels. The ordinary effects of cancer in appreciable masses upon the local lymphatic vessels are not lymphotropic but purely indifferent mechanical effects leading ultimately to compression

and disappearance of the lymphatic vessels within the interior of a cancer. Lymphatic thrombosis plays very little part in these phenomena. Cancer cells generally do not remain for any length of time within the lumen of a lymphatic vessel that is the spread of cancer cells by their growth as cords in the lumina of lymphatics is an unusual phenomenon in cases of operable cancer. When it does occur such permeation seems to be generally only of microscopic extent. The claim that permeated lymphatics and cancer cells present in them are destroyed by thrombotic changes could not be confirmed.

JOSEPH K. NARAT, M.D.

Bacon H. E. Multiple Malignant Tumors with Involvement of the Lower Bowel. *Am J Cancer*, 1939 35 243

A review of the literature on the occurrence of multiple primary malignant lesions with involvement of the anus, rectum or sigmoid (omitting malignant polyposis) discloses 145 reported instances with one or more multiple growths in this locality. In 27 instances there were two carcinomas and in 5 instances there were three confined to the anus, rectum and sigmoid colon. In a larger number of cases other portions of the gastro-intestinal tract were involved, while in a few instances growths were present in systems unrelated to the rectum and sigmoid (breast, larynx, prostate, skin).

Seven new cases are presented in this report and in addition 3 cases that may well be examples of contact cancer.

In instances in which two or three malignant growths each showing the same histological characteristics are confined to a relatively short segment of bowel it is possible that contact implant rather than multicentric origin may explain the presence of multiple tumors.

Six authors have reported instances of carcinoma and sarcoma in the same individual. The tumors arose in wholly unrelated systems.

MANUEL L. LICHTENSTEIN, M.D.

Burke E. M. Sarcoma of the Soft Tissues. *Am J Cancer* 1939 35 234

At the State Institute for the Study of Malignant Disease, Buffalo, New York, about 5 per cent of all malignant tumors are sarcoma of the soft tissues. They may arise wherever there is tissue of mesoblastic origin. This study excludes all neoplasms of lymphoid tissues and bone as well as a specialized group of soft tissue tumors called myxosarcomas.

The 201 patients in this series included 107 males and 94 females. The upper extremities were the site of the primary growth in 30 instances, the lower extremities in 62. Forty-five lesions were on the thighs, the most common site of origin. In 33 patients the primary site was on the head, face, or neck. In 7 instances the abdominal organs were involved, while in 23 cases the lesion was in the mouth, pharynx or nasopharynx. The remaining 37 instances involved the chest, abdomen and back.

The lesions varied in duration from three months to more than thirty years. The lesions of longest duration grew slowest and gave the best prognosis. Rapidly growing tumors caused the patient to seek early treatment, were more malignant and were associated with the poorest prognosis. In spite of wide excision, recurrences are common and the tumors are prone to metastasize, especially in the later stages of the disease. Sarcoma can be classified into definite histological grades.

Tumors of Grade I are made up of large and small spindle cells with a plentiful stroma of dense fibrous connective tissue of adult type. Round cells are absent and very few mitotic figures are found. This grade, while exhibiting definite malignancy, is histologically similar to the more cellular of the benign fibromas.

Grade II tumors consist of hyperchromatic spindle cells with an infiltration of round cells. Mitosis is more frequent and the growth is more vascular. Some loss of intercellular substance is noted.

In Grade III the tumors display a mass of spindle and round cells, increased mitosis, and vascularity, together with a loss of intercellular substance. An occasional giant cell is found.

Grade IV is represented by the highly cellular spindle cell tumor, with many giant and round cells. Vascularity is increased and mitotic figures with many irregular forms are abundant. Marked variation in size, shape and staining qualities is noted in the neoplastic cells.

The prognosis in the higher grades is poor and only a small percentage of patients remain well for a five year period. MANUEL E. LICHTENSTEIN, M.D.

Bick E. M. End Results in Cases of Fibrosarcoma of the Extremities. *Arch Surg* 1938 37 973

Each case of fibroblastic tumor of an extremity presents an individual problem. Is the tumor benign? If it is borderline or obviously malignant, what is its virulence? Is amputation necessary? Is irradiation necessary? Can one afford to excise the tumor and continue observation for recurrence? On the basis of 24 cases the following answers are submitted.

1. Any fibroblastic tumor of the extremity for which complete surgical excision of a primary lesion is anatomically feasible should be so treated. By complete surgical removal is meant not only removal of the visible tumor tissue but removal of enough of the surrounding normal structure to make sure that there is no residue. The extent of the excision cannot be measured in centimeters; it must remain a matter of surgical judgment.

2. When complete surgical excision is not anatomically feasible, amputation of the limb is imperative at the time the primary tumor is judged malignant by competent study of the gross specimens *in situ* and by microscopic study of adequate tissue. This is true regardless of the degree of malignancy as judged by the pathologist. It will be found that many fibrosarcomas of the deep fascial tissues of

the thigh or fibrosarcomas originating in the periosteum of the femur fall within this category that is it is difficult to assure their complete surgical removal

3 Amputation is imperative at the first sign of recurrence of a fibrosarcoma

4 It has not been proved that irradiation technique as applied up to this time alters the eventual outcome in such cases Fibrosarcoma is resistant to present day radiotherapy JOSEPH K. NARAT M.D.

### DUCTLESS GLANDS

Bernheim A. R. and Carlock J. H. Parathyroidectomy for Raynaud's Disease and Scleroderma Late Results *Arch Surg* 1939 38 543

The rationale of parathyroidectomy for Raynaud's disease and scleroderma was suggested to the authors by the following observations (1) in a patient totally disabled by generalized scleroderma the accompanying symptoms of Raynaud's disease in the hands and feet were somewhat improved after calcium therapy and (2) sclerodermatous changes could be produced in both rats and mice by the intraperitoneal injection of parathyroid extract As a clinical experiment therefore parathyroidectomy was performed in the aforementioned patient and an encouraging result was obtained

The authors review the pathological physiology of hyperparathyroidism and discuss some of the functions of calcium in the body As a result of an observation covering a number of years Bernheim formed the opinion that in certain persons a continued calcium deficiency may increase a predisposition to vasospasm In diseases in which some of the symptoms are due to vasospasm relief in a large number of cases followed the use of a diet adequate in calcium

It is the authors' concept that in cases in which the disease responds to calcium treatment the parathyroid glands are relieved of their extra work in drawing calcium from the bones and may return to a normal physiological state However in certain instances improvement does not take place in spite of prolonged and intensive treatment In such cases more or less permanent change may have occurred (permanent hyperplasia or disturbed function of the parathyroid glands) hence removal of one or more of the bodies seems indicated It seems conceivable that vasospasm the occurrence of which in Raynaud's disease is well established plays a role of like importance in scleroderma In many cases symptoms of Raynaud's disease and scleroderma occur together

The histories of 17 cases of Raynaud's disease and scleroderma treated by parathyroidectomy are described and the late results appraised In most cases of true hyperparathyroidism the calcium content of the blood is found to be elevated and the phosphorus decreased In no case of this series did hypercalcemia occur A possible explanation of this difference may be that in the former condition over activity of

the glands is the result of disease which disturbed the normal relation between the stores and the blood whereas in the latter normal glands overwork to maintain a normal calcium level in the blood It was also noted that the inorganic phosphorus content of the blood was elevated above normal in most of these cases This discrepancy could not be explained

It was noted in the cases of Raynaud's disease in which the condition was not associated with sclerodermatous changes that improvement followed immediately after the operation but did not continue In all such cases the symptoms eventually returned Improvement occurred in all cases of scleroderma and was maintained in all but one In a number of cases the greatest improvement in symptoms did not immediately follow the operation but occurred several months later

There seemed to be no contraindications to the operation In none of the patients did symptoms of tetany develop at any time nor were there any other postoperative complications There was no mortality

The authors conclude that parathyroidectomy has no place in the therapy of Raynaud's disease While the immediate results are impressive and often dramatic the late results do not measure up to the expectations expressed in their original paper However in the treatment of scleroderma whether the condition is generalized or confined to the hands and face they are of the opinion that parathyroidectomy offers the patient the probability of recession of the disease in the early stages, and of halting of the process in the late ones At present no other method of treatment is known which offers this outlook to the patient suffering from scleroderma

SAMUEL H. ALLEN, M.D.

Heckel G. P. and Allen W. M. Maintenance of the Corpus Luteum and Inhibition of Parturition in the Rabbit by Injections of Estrogenic Hormone *Endocrinology* 1939 24 137

The authors have previously shown (1936) that the injection of estrogenic hormone beginning on the eleventh day of pseudopregnancy in the rabbit prevents regression of the corpora lutea and that corpora caused to persist by this means are functional

The purpose of the present experiments was to determine whether injections of estrogenic hormone would have a similar effect on the corpora lutea of pregnancy The factors concerned in parturition in the rabbit are not fully understood but it is established that parturition can be prevented either by the introduction of new corpora lutea or by the injection of progesterone and the premature delivery can be produced by removal of the corpora

In a group of preliminary experiments injections of estrogen were begun on the nineteenth, twentieth, twenty-first or twenty-third days of pregnancy and continued either until delivery had occurred or until the animal was killed at the conclusion of the experiment The injections were made so that the dose gradually increased the expectation being that this

method of administration might yield an estrogen level sufficiently high to prevent regression of the corpora and, hence, parturition. The individual experiments show that in no case in which the maximum total daily dose was 175 IU or less was parturition prevented from taking place at about the usual time. Animals receiving doses larger than this had macerated fetuses when they were killed on from the thirty second to the thirty eighth day. One of these was killed on the thirty sixth day. The corpora lutea were large and histologically appeared to be normal. The uterus contained 4 macerated fetuses. This suggests that the injections had maintained the corpora and also had killed the fetuses. The main reason for presenting these preliminary experiments is to show that premature delivery does not occur even though a quantity of estrogen sufficient to kill the fetuses is given. This result is contrary to reports in the literature that estrone induces abortion in rabbits.

In the next group of experiments 6 rabbits were injected with estrogen beginning on the twenty seventh day and 1 beginning on the twenty eighth day of pregnancy, each receiving from 150 to 500 IU daily. In each case this quantity caused death of the fetuses and continuation of pregnancy beyond the thirty second day, the usual time for delivery, 2 deliveries occurred on the thirty fourth day, 1 on the thirty fifth and 2 on the thirty ninth day. Delivery occurred in spite of continuation of the injections except in 1 case in which cessation of the injections on the thirty sixth day was followed by delivery on the thirty ninth day. The remaining animals were killed undelivered on the thirty seventh day. In both the corpora lutea had not regressed as they would have if estrogen had not been given and normal parturition had occurred on the thirty second day. From these results it seemed evident that the corpora were being maintained by the estrogen and that their continued function was the reason for delay in parturition. Consequently 6 more rabbits were given comparable doses of estrogen but the ovaries were removed on the twenty seventh day at the beginning of the injections. These 6 all delivered spontaneously on the twenty ninth, thirtieth, or thirty first days, 4 of them giving birth to some living fetuses and 2 delivering macerated fetuses.

Another group of 10 animals was given estrogen beginning on the twenty ninth day of pregnancy, the daily dose ranging from 100 to 1,000 IU. None delivered on the thirty second day. All animals receiving between 100 and 375 IU daily delivered spontaneously but in each case, except 1 which delivered on the thirty third day, delivery was delayed from three to seven days. Two animals receiving doses of 500 and 1,000 IU, respectively, were killed undelivered on the forty fourth and fifty second days. The corpora lutea were examined in 4 animals. One was killed on the thirty sixth day when delivery occurred the others were killed undelivered on the thirty fifth, forty fourth and fifty second

days, respectively. The corpora from these were of a size similar to that of late pregnancy and were essentially normal histologically. To show that the corpora must be present for the inhibition of parturition, 5 animals were castrated from one to five days after the injections were begun. Spontaneous delivery occurred within forty eight hours despite continuation of the injections of estrogen. This was in direct contrast to the results in animals in which similar injections were made but in which the ovaries and, hence, the corpora lutea were intact. These controls were perhaps better than those of the group castrated on the twenty seventh day because in the latter group the estrogen was given time to exert an effect on the ovaries before they were removed, whereas in the previous group they were removed the day of the first injection.

In view of the finding that injections started as late as three days before term were effective in causing delay, a smaller series was studied in which injections were begun on the thirtieth and thirty first day. These show several interesting things. Of 3 animals each given 500 IU daily beginning on the thirty first day, only 1 delivered normally, 1 of the others delivered on the forty first day and the third was killed undelivered on the forty fifth day. In complete delivery occurred occasionally. One, in which injections of 500 IU were begun on the thirtieth day delivered 1 living and 3 dead fetuses on the thirty first day, but failed to deliver 5 more. On the fifty second day a laparotomy was made and both ovaries, which contained large pink corpora lutea, were removed. Death occurred two days later for reasons which were not apparent at autopsy. The foregoing experiments show also that in every case in which a significant delay in parturition was obtained or in which parturition failed to occur the fetuses were dead. The exact cause for the fetal death has not been determined.

A final group of experiments was carried out to confirm the observation by others that estrogen induces abortion in rabbits, and to show that when abortion does occur under these conditions it is associated with regression of the corpora lutea.

The major significance of the experiments, however, probably lies in the observation that the injection of estrogenic hormone beginning even as late as one day before delivery ordinarily occurs, will cause the corpora lutea to remain functional and thereby prevent parturition, presumably because of the continued capacity of the corpora for producing progesterone.

ELLA M. SALMONSEN

#### EXPERIMENTAL SURGERY

De Blasi A. Experimental Staphylococcal Bacteremia (La batteremia sperimentale stafilococcica). *Polidatt.* Rome 1038 45 sez. chir. 501

The contradictory reports on the multiplication of bacteria in the circulating blood induced De Blasi to initiate his experiments to settle this question. He used guinea pigs two or three months old and weigh

ing from 400 to 500 gm. which he kept under observation for several days before the experiment. Each animal was given under strict a septic conditions an injection of pure bouillon culture of staphylococcus pyogenes aureus into the jugular vein the amount injected varying from a minimum of 0.25 c cm. for the first groups of animals to a maximum of 0.50 c cm. for the last groups and corresponding to one half of the dose causing the death of an animal of 400 gm. within twelve hours. For the demonstration of bacteria in the circulation blood culture was used in bouillon or on agar plates the latter being preferred because it facilitates early diagnosis and correct counting of the number of colonies. The blood was collected by means of a platinum loop from an incision into the marginal veins of the ear two or three, ten, twenty, thirty, forty, five and sixty minutes and two, three, four, six and twenty four hours after the inoculation and then every day until the death of the animal. Forty eight guinea pigs were employed.

1 The first group of 15 animals was subjected simply to circulatory infection this experiment making possible the observation of the behavior of the bacteremia in the normal guinea pig.

2 The second group of 10 animals was first subjected to an intramuscular injection of 2 c cm. of a 1 per cent aqueous solution of trypan blue on alternate days for from 5 to 7 times. Two days after the last injection of staining material they were infected 2 controls were used.

3 The third group of 8 animals was subjected to splenectomy and was infected four days later 2 controls were used.

4 The fourth group of 8 animals was artificially subjected to hepatic lesions by the oral administra-

tion of 12 drops of a 1 per cent solution of phosphorus in oil on alternate days for from 7 to 9 times 3 controls were used.

The 32 animals which were killed were submitted to a careful necropsy cultures were made on agar with the blood found in the heart lungs liver spleen and kidneys and samples of these organs were collected for future histological examination.

The results obtained allow the following conclusions.

The production of a staphylococcal bacteremia in the guinea pig with 1 intravenous injection of a large quantity of bacteria does not determine a multiplication of these bacteria in the circulation. There is no demonstrable parallelism between the positivity of the blood culture and the general condition of the guinea pig often during lethal infections the blood culture strongly positive in the initial stage becomes negative or only slightly positive this seems to occur also in man. The preponderant importance of the reticulo endothelial system in blood infection is demonstrated the progressive (hypertrophy hyperplasia) and regressive (necrosis) phenomena reveal its hyperactivity but they do not seem to possess any specific character. Artificially produced lesions of the reticulo endothelial system and of the liver (splenectomy and fasting are capable of inducing a more rapid and more serious course of the experimental blood infection. The results obtained in the experimental field cannot be transferred to the clinical field in any case because the conditions under which the blood infection occurs are not at all comparable although the means of defense of the organisms against infection should be considered as equal.

RICHARD KEMEL, M.D.

# INTERNATIONAL ABSTRACT OF SURGERY

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## PRINCIPLES OF SURGICAL PRACTICE

### WOUND HEALING

MICHAEL L. MASON M.D. F.A.C.S., Chicago, Illinois

**D**URING recent months a number of papers have been presented in the International Abstract of Surgery in the effort to stress fundamental problems of surgery. Particular reference is made to the papers of Reid and Stevenson on the 'Treatment of Fresh Wounds' of Meleney on the

Management of Surgical Septicemia of Koch on 'The Cure of Infected Wounds' of Brown on the 'Covering of Raw Surfaces,' of Hartzell and Winheld on 'Wound Disruption' and the reports of the noonday conferences at the 1938 New York Clinical Congress on "Wound Infection" presided over by Mont Reid, and on the

'Treatment of Open Wounds' presided over by Roy D. McClure. These have all been directly concerned with important everyday problems of wound healing and wound infection.

The following paper is the final one of this group and sums up the entire problem with perhaps a little greater stress on the historical background and on recent clinical and experimental investigations relating to the prevention of wound infection and the healing of wounds. If it may seem to readers that too little mention is made of the application of much of the most recent experimental work on the stimulation of healing by means of wound stimulants and if the almost unconditional condemnation of antiseptics may seem unjustified in view of the recent studies of McClure and his co-workers, it is not because the writer does not appreciate their far-reaching possi-

bilities. As McClure has stated surgery must always advance and we cannot assume that no further progress is possible. It does not seem unlikely that some day a specific wound antiseptic will be developed which will be entirely or almost entirely harmless to tissues but destructive to germs. It is not at all unlikely that as the understanding of the intricate chemical processes of healing advances wound stimulants capable of practical usage will be discovered. However at the present time such antiseptic and stimulating substances are still in the experimental stage and when they have been used clinically there has been some question as to the mode of their action. It is certain that even if such substances could be isolated and if the chemical processes of healing could be favorably altered by therapeutic measures the surgeon still could not ignore other fundamental principles of wound repair.

We offer no apology for what might seem to some readers undue emphasis upon subjects with which every surgeon is assumed to be familiar. Too often in Reid's words these subjects have served as fillers for text books and have been passed by with only a nod of recognition by the busy student and interne hastening into the arena of practice. Some men would maintain that after all one must learn surgery by practicing it and cite the child who becomes proficient in speaking his mother tongue by constant use and constant contact with it. They would have to add however that if the child would become a master of his language he must spend many months and years in a study of grammar, of words and their meaning, of the fundamental

From the Department of Surgery, Northwestern University Medical School and the Assaunt Memorial Hospital, Chicago.  
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background of his language and so could he hope to lift himself to a higher plane of proficiency and achievement

Unless the surgeon keeps asking himself, How do wounds heal? How does nature combat infection? How can the surgeon aid in hastening these processes? he is very likely to fall into that unthinking mechanical routine that makes progress impossible and gives him simply a number in the assembly line rather than a place on the directing staff

The most ancient of the healing arts has been the care of injuries and the earliest medical observations of man have concerned themselves with the healing of wounds. Even animals by instinct alone have learned something about the care of wounds. It is recorded that in its naive state the monkey after a flight through trees and bushes cleans himself of thorns and twigs and assists his neighbor in so doing—a service reduced largely to a search for parasites in the case of the monkey in captivity. Livingstone has noted that the wounded gorilla withdraws the spear from his body and dresses the wound with leaves to allay hemorrhage. Primitive man carried over with his evolutionary progression not only a keen interest in wounds but also methods of dealing with them. Fractured bones have come to us from the stone age and the satisfactory healing evidenced by many of them indicates that even before recorded history began man had learned to apply splints to keep the part at rest and to maintain apposition. We can logically assume that even before the time of the Egyptian papyri three of the principles of wound healing had been established namely the removal of foreign material the control of hemorrhage and the maintenance of rest. Many strange and fantastic conceptions of disease and treatment are recorded but it is of interest to note how these three principles with increasing refinement appear disappear and reappear in surgical writings up to the present day.<sup>1</sup>

In the pre Listerian days the surgeon was handicapped by a lack of knowledge of bacteria although he undoubtedly suspected their presence. Except for this fundamental lack however the ancient surgeons made many keen observations on the healing of wounds and recognized certain factors in the process which we would do well to re-emphasize today. The Talmud warns against touching wounds with the hands since the fingers cause inflammation.

The ancient Hindus practiced wound closure with linen or bowstring sutures. The Greek surgeons emphasized the need for cleanliness in the operating room and prescribed careful cleansing of the hands and nails and the wearing of clean clothing. Theodorice in the 13th century warned against the probing of wounds and taught the need for cleanliness. He maintained that wounds may be closed and that they would heal without suppuration if properly cared for a phenomenon that was not seriously considered possible except in rare isolated instances until the late 19th century. Henry de Mondeville advised the washing of wounds to remove foreign matter and the avoidance of all things likely to cause pus. Larrey, surgeon to Napoleon recognized the need for the immediate care of wounds and established the twenty four hour limit in the Napoleonic armies. He emphasized the necessity of rest and pointed out the harmful effects of too frequent changes of dressings—many of the wounded in the ill fated Russian campaign were transported from Russia into France before their original dressings were removed. Diefenbach as early as 1850 advised wound excision so as to convert irregular crushed wound edges into clean regular ones which could be closed primarily. Pirogoff went to great trouble to obtain clean water for the cleansing of wounds and by the introduction of the use of plaster of Paris in war surgery showed that he recognized the great value of rest in wound repair.

One further conception of wound healing emerges from the great mass of superstition and black magic of ancient and medieval medicine. It was early expressed by Celsus who noted that the natural reactions of nature were often beneficial and that such a phenomenon as fever might be helpful in promoting cure. The idea that the tissues possess the power of healing in themselves may be inferred from the teachings of Theodorice but it reaches its first unequivocal expression in the writings of Paracelsus. Out of his tremendous amount of confusing rhetorical and bombastic argumentative writings some so obscure and mingled with alchemistic and mystical references as to be almost unintelligible there develops a conception of the treatment of injuries entirely new and different from anything which had gone before. It can be expressed no better than in his own words: "For you should know that by their nature the tissues contain within themselves an inborn balsam which heals wounds. So should every surgeon know that it is not he but nature that heals wounds. But that the surgeon should know in what manner he may serve to further nature's healing let him protect the

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wound from ever present external enemies that they do not interfere with or poison nature's balsam but that it may be allowed to work with all its natural forces under the surgeon's protection. Under protection and rest and skillful dressings nature heals the wound edges together and makes the flesh grow. For what makes flesh and blood and marrow? not man not food but nature which possesses in itself the power to grow and multiply. Food and drink only support this power the rain and the earth do not make wood only the tree itself can do so, but without rain and earth the tree dies. Paracelsus however did not busy himself greatly with operative surgery although it is probable that he had experience in the handling of war wounds, and it remained for a more practical and less evangelistic surgeon Pare to recognize the validity of Paracelsus' teachings and bring them before the profession of his day. Pare's observation on the harmful effect of severe traumatizing agents was accidental, but his teachings of the value of bland dressings and his dictum, "I dressed him—God cured him" have come down to us as epochal contributions to surgery.

Samuel Gross in the middle of the 19th century expressed again the conception of wound healing and care which Paracelsus and Pare had so brilliantly defended. It remained, however for Wm S. Halsted to develop the rational care of wounds—accidental and operative—based upon a study of the process of repair. As Reid has stated Halsted "tried at all times to evaluate and apply the various principles of wound healing in his work every study or experiment (was) in variably also made a problem of wound healing. His work has left as its greatest heritage an appreciation of the natural healing powers of the tissues and the necessity for not handicapping these powers with chemical or mechanical trauma, hemorrhage foreign bodies, and infection."

The literature for the past twenty years is replete with reports of studies of wound healing and the exhaustive review by Arey published in 1936 deserves careful study by every surgeon. The gross and microscopic changes during wound repair are well known and we also know many of the factors which influence them. The actual reparative stimuli which appear to be protein in nature and are derived from leucocytes and other tissues have been the subject of many studies and we know something about their nature. As to the actual nature of the healing process however how and why these growth promoting substances act we know very little. Healing appears to be a natural property of liv-

ing organisms, which under certain optimal conditions proceeds at a definite and measurable pace. One cannot help but marvel at times at nature's tremendous powers of recovery despite apparently insurmountable obstacles. As examples of such reparative powers I should like to relate observations which Harvey S. Allen made during the course of some experiments with the healing of tendons. In a number of the dogs used for the experiment, a tube of catgut was slipped over the divided tendon the tendon was sutured, and the tube was then slipped down over the site of the suture. In all of the experiments the tube behaved as a foreign body and led to a marked exudative reaction and in many of the dogs the tendon failed to heal. In one instance, however the tube was extruded from the wound and functional healing took place between the tendon ends. In another instance the tendon healed as a thin strand on the under surface of the tube which lay in a mass of gelatinous granulation tissue on the upper surface of the newly formed fibrous tendon.

The problem of wound disruption in abdominal surgery is entirely one of wound healing and has been the subject of considerable study. It was the topic of a symposium given by Meleney and Howes, Colp, Grace White and Heyd at the New York Surgical Society meeting, November 8, 1933. Several recent reviews by Jenkins in Chicago, Falls of the Henry Ford Hospital in Detroit, Glenn of New York, Singleton and Blocker of Galveston, and Hartzell and Winfield of Detroit, attest to the importance of wound disruption. These reviews however more than anything else serve to focus the surgeon's attention on the numerous factors of wound healing and to emphasize not only the major catastrophe of evisceration but other complications of healing which affect wounds and operative incisions on other parts of the body. While actual disruption occurs probably in from 1 to 2 per cent of abdominal incisions wound disturbances of an equally serious nature as far as the wound is concerned, occur in a so much higher percentage of accidental wounds of the extremities that the occasional evisceration is a distinct rarity in comparison.

The factors which have to do with wound healing may be divided into those which act directly at the site of the injury and those which have an effect of a more general nature and act through the organism as a whole. It is not my purpose to maintain the theme that the local factors are more important than the general ones although it has seemed to me that the disturbances in heal-

ing which we encounter clinically, may be more often ascribed to a local disturbance than to some general pathological state or to the absence of healing power. Even in acute starvation healing proceeds as usual unless the starvation actually threatens life itself. The urge to heal is almost equal to the urge to live; nature will surmount all obstacles to close a wound. Before we can assume that the healing powers and stimuli to heal are absent or defective, we must make certain that delayed healing is not due to impediments which we have put in the way. Nature works methodically; the removal of debris, dead tissue, blood clots, and invading bacteria must precede the actual repair. Certain it is that both the local and the general factors which may delay repair are quite largely under the surgeon's control.

Of the local factors which interfere with wound healing, infection has probably received too great an emphasis at the expense of other equally important ones. It is not my desire to minimize the epochal importance of the work of Pasteur and Lister; rather it is to emphasize the fact that the prevention of infection is not synonymous with the use of antiseptics. Whether or not infection will develop in a wound or operative incision will depend upon the nature of the contaminating microorganisms and upon whether or not the soil within which they find themselves is favorable for growth. The development of infection will depend to a large extent upon those things which lead to disturbances of healing, so that we can look upon infection simply as a complication of healing. Whether or not infection will occur will depend in turn upon our success in ridding the wound of a sufficient number of bacteria and leaving the tissues in a condition able to combat successfully the bacteria that remain.

We may begin with the assumption that every wound, regardless of how it is made—operatively or accidentally—is contaminated. Meleney has shown that even in a well appointed operating room bacteria fall on a Petri dish at the rate of from 2 to 2 per minute, and similar studies made elsewhere have substantiated his findings. Ives and Hirschfeld have made cultures from clean operative wounds at various intervals from the time of skin incision to the time of closure and have found that positive cultures can be obtained from the subcutaneous tissues in practically 100 per cent. Even the peritoneum can be shown to be contaminated in almost 90 per cent. These wounds all healed by primary intention. Duntz and Gutscher have been able to culture bacteria

from approximately 80 per cent of accidental wounds. It is interesting that slightly more than half of the wounds which gave a positive culture before treatment healed by primary, while the remainder healed by secondary intention. In contrast, about three fourths of the wounds which were found to have negative cultures previous to treatment healed without reaction while about one fourth healed by secondary intention. It is not at all improbable that with better methods of obtaining cultures all would have been found to have been contaminated.

The bacteria which contaminate a wound vary in virulence and pathogenicity, and in their ability to accommodate themselves to growth in the host. We can seldom predict just how readily a certain strain of bacteria will grow in a particular human host. For clinical purposes, however, we may divide the sources of wound contamination into two categories: contamination with bacteria from their natural habitats and contamination with bacteria from human or analogous sources. To the first category belong such organisms as gain entrance to wounds at time of injury from an object not recently contaminated from human sources. To the second category belong those organisms which are transferred directly to the wound from a human host from a culture or from certain animals. To this category belong such sources of contamination as the human bite, animal bites, the tonsil snare, droplet infection, or the transference of organisms by means of contaminated fingers, instruments, or dressings.

This distinction between the two sources of wound contamination is important. It has been shown that the incubation period for bacterial growth in human tissues varies with the organisms and with the recency with which they have been in contact with human hosts or appropriate culture media. When organisms gain entrance to tissues they do not at once begin to grow but lie dormant for some time until they become acclimated to their new environment. During this period of acclimatization or incubation they remain localized to the site of entrance and the wound is merely contaminated; if proper measures are taken the bacteria may be mechanically removed before infection occurs. After the period of incubation or acclimatization has passed, growth occurs and the wound is infected; mechanical cleansing cannot then be accomplished; in fact, local surgical measures may be extremely dangerous.

Bacteria introduced into wounds at the time of the injury from dirt, dust, and soil from the

broken bottle windshield, or window pane, or from the moving parts of machines and tools are rarely if ever accustomed to human tissue fluids. As Friedrich has stated, they are in that "vegetative condition in which organisms find themselves in the external world." Following their introduction into the tissues a period of adjustment (the period of contamination) occurs and we know pretty well how long this period lasts. The experiments of Friedrich published in 1898 have shown that if soil and dust are placed in the thigh muscles of guinea pigs, a period of from four to six hours elapses before the bacteria become invasive. If the contaminated muscle is excised within six hours all of the guinea pigs survive. If from six to eight hours elapse, 50 per cent of the animals succumb while after eight hours elapse all of the animals succumb to infection.

The last World War was the great clinical testing ground for Friedrich's experiments. The wound treatment which finally emerged from the war was immediate mechanical cleansing followed by closure (debridement and primary or delayed primary suture) within the first six to eight hours after injury. If the wounded were seen later than this—usually a maximum of eight hours was taken as the limit—the wounds were treated as infected.

The problem as to methods of removal of these organisms from wounds has been attacked from two viewpoints. First has been the attempt to destroy them with heat or chemicals. Boiling oil and the red hot iron<sup>1</sup> have passed into the shades of medieval surgery—almost, while chemical antiseptics as a more modern counterpart have still not reached that stage of perfection where they destroy bacteria without injuring also the delicate living cells upon which healing depends. It is my belief that, except for certain specific and limited indications, the patient with an open wound would be better off if we had no antiseptics at all and if we were compelled to rely on mechanical cleansing and washing. The false security given by a small bottle of colored antiseptic appears to compensate for the neglect of cleansing and salves our conscience with the feeling that by pouring a more or less painful substance into a wound we have done all we can to render it sterile. To see how far wrong such an assumption is we need only observe a group of wounds so treated. The tremendous amount of damage and harm to living tissues done with

antiseptics is a credit to the drug salesman and a discredit to us. Any chemical agent capable of destroying organisms is also capable of destroying living cells.

The second method of removing bacteria from wounds has been that of mechanical cleansing, which Friedrich suggested on the basis of his experiments. He advised complete wound excision, provided the time limit of six hours was not exceeded. If this limit is passed the wound is no longer amenable to mechanical cleansing. Complete wound excision is not always possible nor is it necessary. Bacterial contaminants may be washed from wound surfaces in the same way that we wash our hands preparatory to an operation. This washing and cleansing with soap and sterile water is both efficient and feasible and can be depended upon to produce a surgically clean wound, provided the patient is seen and the cleansing accomplished within the first six hours after injury.

When we come to consider bacterial contamination from human sources, the situation is quite different. These organisms may be very virulent and are already more or less immune to the human antibodies or other immune substances. They may begin to grow within a very short period of time, they may become invasive almost at once and attempts at mechanical removal are often of little avail. A virulent infection may develop within two or three hours. Wounds which are contaminated from sources of this type can seldom be seen sufficiently early to allow cleansing and must therefore be considered to be infected.

Unfortunately, organisms from human sources usually gain entrance into the wound *after* rather than *at* the time of injury. They may be introduced at the time of first aid by handkerchiefs or soiled dressings, eager fingers or unsterilized instruments used to stay a hemorrhage, or from droplet contamination from numerous bystanders. They may gain access to the wound during hasty examination without proper precautions in the emergency room, where masks and gloves are frequently forgotten. The horrifying evidence of these secondary infections in the days before Lister is a matter of historical record. Von Redwitz has noted that such infections (notably hospital gangrene, pyemia, tetanus, and erysipelas) ran like a pest through the hospital wards. Following 1,277 operations, the majority of which were amputations and reductions of open fractures, collected by von Redwitz from the records of leading European surgeons there were 374 deaths, a mortality of 45 per cent, almost all due

<sup>1</sup> We have seen many wounds so charred by the coagulator and the cautery knife that if they were traumatic wounds a careful effort to excise the dead tissue would be made. Reid and St. Jensen.

to sepsis. Such gross contamination does not obtain today, but we still have secondary infection with us. This source of wound contamination we can in a large measure control. It is the source to which Holmes and Semmelmweis called attention. It is the break in aseptic care which occurs between the time the patient is injured and the time he reaches the place where the wound is to be treated.

We can control this source of wound contamination by teaching proper first aid care of wounds and by observing strict asepsis at all times during our care of wounds. The first aid men should be taught that open wounds should be let alone; they should not be probed or investigated; nor should antiseptics be poured into them; they should be covered with a sterile dressing bandaged on snugly. Copious hemorrhage may be controlled with the pressure dressing or if necessary with a tourniquet. The part should then be put at rest on a splint or in a sling to prevent further damage and to allay pain during transportation and the patient should be sent to the emergency room or office for care. Here strict asepsis should be observed. Examination for sensation and motion may often be accomplished without removal of the first aid dressing. Examination of the wound should be restricted to simple inspection—no probing or digital exploration. Even during this inspection mouth and nose masking is advisable. Not until preparation for repair has been made and a proper aseptic set-up secured should the wound be exposed and treated. The open wound regardless of the amount of apparent contamination should be treated as a clean operative wound from the time of its inception until its proper aseptic closure. It is only by the observance of strict aseptic technique that we can avoid secondary contamination of the accidental wound.

Further reduction in the number of bacterial contaminants entering wounds at the time of operation is accomplished by the control of the air in the operating room. It is a curious thing that Lister's first application of Pasteur's discovery of bacteria was the attempt by means of a carbolic acid spray to keep air borne bacteria from the operative field. His efforts in this direction were largely misunderstood and the carbolic acid was poured into the wound where it or one of its modern counterparts is still poured today to the detriment of clean healing. However with in the past few years largely because of researches made by Meleney, Hart, Truesdale and others efforts are being made to sterilize or at least materially reduce the bacterial content of operating

room air with reduction in postoperative infection<sup>1</sup>

The second factor which interferes with wound healing is the presence of dead or hopelessly devitalized tissues which favor bacterial growth and must be absorbed or extruded before repair can take place. Particularly dangerous are crushed and devitalized skin, fascia, and muscle which are likely to occur in wrenger railroad automobile and punch press injuries. Such damaged tissues should be removed by sharp dissection as one of the first steps of the operative care. This procedure must not be confused with wound excision which is done to remove contaminated tissue—the object here is the removal of tissue which cannot survive. Skin flaps which are separated from their base of vascular supply, lifeless avascular muscle and shredded crushed fascia in fact any tissue which will become necrotic should be excised before the wound is closed. However the original trauma is not always the only source of necrotic tissue and it is illogical for the surgeon to spend much time in removing crushed skin and devitalized fascia only to leave in his wake more areas of similarly injured and devascularized tissues due to his own efforts. The necrosis and sublethal tissue damage following chemical antiseptics have been alluded to above. The promiscuous use of antiseptics in the open wound usually contraindicates extensive nerve and tendon repair which might otherwise have been possible. It is almost impossible to avoid mechanical injury to delicate living cells because of the very nature of the operative act, but this should be reduced to a minimum by gentle handling of the tissues avoidance of rough retraction careful sharp dissection in place of blunt dissection the use of a knife in place of scissors gentle sponging and retraction of the tissues with hooks or retractors rather than grasping them with heavy hemostats with the resultant crushing of large masses of living matter.<sup>2</sup>

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Two other sources of devitalized tissue may be controlled by the surgeon during operation. The effect of exposure of the tissues to air and to the heat of the operating lights may be forgotten until at the end of a long operative procedure we find the fatty subcutaneous tissues and exposed nerves and tendons dry and shrunken. This may be prevented by keeping tissues moist at all times with salt solution. Bits of fat and other tissues (and incidentally bacteria) are left in the wound in the wake of any surgical procedure. These if they remain in the wound must be absorbed and in case of bacteria may lead to infection. It is therefore advantageous during operations for accidental injuries of the extremities and with certain limitations in other instances to wash the wound from time to time with a stream of normal salt solution.

The presence of blood and hematomas in the wound after closure leads to disturbances of healing. Careful hemostasis before closure and the use of a pressure dressing afterward tend to prevent the oozing which is almost certain to take place otherwise. In keeping with the indication to produce no further damage and to leave as little devitalized tissue as possible in the wound, the bleeding vessels should be carefully caught so as to avoid the grasping of large amounts of surrounding tissues since all structures distal to the ligature are destined to necrosis. Mass ligation and suture ligation for troublesome oozing or for bleeding which is difficult to control leaves behind in the aggregate a considerable amount of devitalized tissue which predisposes toward postoperative suppuration. As Reid has pointed out we are somewhat in a dilemma with regard to hemostasis since each vessel caught and ligated adds to the aggregate of necrosis with which the wound must cope and also increases the total amount of foreign matter left within the wound. Gentle pressure during the operation will control a great deal of the minor bleeding and oozing and will diminish the number of ligatures necessary. The surgeon however, should not sacrifice the ideal of a clean dry field, bleeding points which are not readily controlled by gentle pressure with a moist sponge should be ligated with fine silk. Postoperative oozing which is sure to

occur from the surfaces of any wound and may lead to a serious accumulation of blood and serum in the tissues is easily controlled by the use of a pressure dressing after the skin has been closed. Large amounts of fluffed gauze may be bandaged snugly over a wound at the completion of the operation and when these dressings are removed from five to seven days later a clean, flat wound will be found.

The use of large amounts of foreign material both as ligatures and in the repair of divided tissues predisposes toward prolongation of the exudative phase, delays healing, and promotes infection. The suture is the most important of the foreign bodies which the surgeon introduces into a wound and in most instances the only one. It has been pointed out that the excellent results which Halsted obtained in his operative work were due to his great attention to careful gentle surgery, meticulous hemostasis and the use of fine suture material. He chose silk and there is today a tremendous swing among surgeons toward the use of silk in clean operative work of all sorts. Suture material causes foreign body tissue reaction because of its size and quantity and because of its own chemical composition. Silk has shown itself much less irritant than catgut and may be used in much finer sizes. The work of Whipple has shown without doubt the superiority of its use in clean surgical work. The experiments of Howes on the strength of wounds sutured with catgut and with silk have shown that the exudative reaction lasts longer with catgut, and that the full strength of the wounds is gained somewhat earlier with silk than with catgut. Fewer complications follow the use of silk as has been shown by Shambaugh's study. He found twice as many serious complications and nearly ten times as many minor ones after catgut as after silk suture. This however, does not tell the whole story since the use of silk usually requires a different technique of handling tissues than catgut. Silk is finer and the strands are more easily broken so that the surgeon must perforce be gentler in handling tissues and there is less tendency to suture under tension. The knots of silk may be cut very short since they do not swell and untie like those of catgut. Because of this factor alone less foreign material is left in the wound. There is however it seems to me, some misunderstanding about the type and sizes of silk which should be used and the manner of silk usage. Silk should be used in the fine grades, the finer the better but since no two manufacturers use the same system of grading silk and since there is no standard it is not possible to

as similar wounds produced with a knife. The necrobiotic zone produced by the current must be dealt with before healing can take place. The disturbance in healing produced is most marked in the skin, less marked in the fat and muscle, while in the brain the wounds seem to heal almost as well as knife wounds. It seems obvious that the high frequency units should be used only when they are indicated, e.g., in the removal of neoplasms and in the control of some of the bleeding points the tying of which would cause some in a 10 sec. unit (time or lead to excess) a traumatization. Their indiscriminate use however to control bleeding which may well stop with pressure must lead to disturbances in healing.

to sepsis. Such gross contamination does not obtain today but we still have secondary infection with us. This source of wound contamination we can in a large measure control. It is the source to which Holmes and Semmeters called attention. It is the break in aseptic care which occurs between the time the patient is injured and the time he reaches the place where the wound is to be treated.

We can control this source of wound contamination by teaching proper first aid care of wounds and by observing strict asepsis at all times during our care of wounds. The first aid men should be taught that open wounds should be let alone; they should not be probed or investigated nor should antiseptics be poured into them; they should be covered with a sterile dressing bandaged snugly. Copious hemorrhage may be controlled with the pressure dressing or if necessary with a tourniquet. The part should then be put at rest on a splint or in a sling to prevent further damage and to allay pain during transportation and the patient should be sent to the emergency room or office for care. Here strict asepsis should be observed. Examination for sensation and motion may often be accomplished without removal of the first aid dressing. Examination of the wound should be restricted to simple inspection—no probing or digital exploration. Even during this inspection mouth and nose masking is advisable. Not until preparation for repair has been made and a proper aseptic set up secured should the wound be exposed and treated. The open wound regardless of the amount of apparent contamination should be treated as a clean operative wound from the time of its inception until its proper aseptic closure. It is only by the observance of strict aseptic technique that we can avoid secondary contamination of the accidental wound.

Further reduction in the number of bacterial contaminants entering wounds at the time of operation is accomplished by the control of the air in the operating room. It is a curious thing that Lister's first application of Pasteur's discovery of bacteria was the attempt by means of a carbolic acid spray to keep air borne bacteria from the operative field. His efforts in this direction were largely misunderstood and the carbolic acid was poured into the wound where it or one of its modern counterparts is still poured today—to the detriment of clean healing. However, within the past few years largely because of researches made by Meleney, Hart, Truesdale and others efforts are being made to sterilize or at least materially reduce the bacterial content of operating

room air with reduction in postoperative infection.<sup>1</sup>

The second factor which interferes with wound healing is the presence of dead or hopelessly devitalized tissues which favor bacterial growth and must be absorbed or extruded before repair can take place. Particularly dangerous are crushed and devitalized skin, fascia and muscle which are likely to occur in wrecker railroad automobile and punch press injuries. Such damaged tissues should be removed by sharp dissection as one of the first steps of the operative care. This procedure must not be confused with wound excision which is done to remove contaminated tissue—the object here is the removal of tissue which cannot survive. Skin flaps which are separated from their base of vascular supply, lifeless avascular muscle and shredded crushed fascia in fact any tissue which will become necrotic should be excised before the wound is closed. However, the original trauma is not always the only source of necrotic tissue and it is illogical for the surgeon to spend much time in removing crushed skin and devitalized fascia only to leave in his wake more areas of similarly injured and devascularized tissues due to his own efforts. The necrosis and sublethal tissue damage following chemical antiseptics have been alluded to above. The promiscuous use of antiseptics in the open wound usually contraindicates extensive nerve and tendon repair which might otherwise have been possible. It is almost impossible to avoid mechanical injury to delicate living cells because of the very nature of the operative act, but this should be reduced to a minimum by gentle handling of the tissues, avoidance of rough retraction, careful sharp dissection in place of blunt dissection, the use of a knife in place of scissors, gentle probing and retraction of the tissues with hooks or retractors rather than grasping them with heavy hemostats with the resultant crushing of large masses of living matter.<sup>2</sup>

At length, I desire to mention the present state of the art in the treatment of wounds. The first step is to clean the wound thoroughly with antiseptics. The second step is to remove all dead or devitalized tissue. The third step is to close the wound with sutures or staples. The fourth step is to dress the wound with an antiseptic dressing. The fifth step is to observe the wound closely for signs of infection. The sixth step is to give the patient adequate pain relief. The seventh step is to give the patient adequate nourishment. The eighth step is to give the patient adequate rest. The ninth step is to give the patient adequate hygiene. The tenth step is to give the patient adequate education. The eleventh step is to give the patient adequate social support. The twelfth step is to give the patient adequate spiritual support. The thirteenth step is to give the patient adequate emotional support. The fourteenth step is to give the patient adequate intellectual support. 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in healing. Particularly disastrous are tight skin sutures where a linear necrosis of the opposed edges may lead to a serious infection. In instances in which closure cannot be accomplished without tension the surgeon should have recourse to the various types of skin grafting in order to close the wound. The same constricting type of necrosis may occur in deeper tissues. Fascia, aponeurosis, and tendons if constricted by tight sutures also become necrotic and lead to disturbances in healing manifested by the development of phenomena which we recognize as infection. It is better that we think of such wound complications as disturbances in healing due to improper operative technique, rather than as infections *per se*.

The principle of rest for injured tissues while generally recognized is too often disregarded. We splint and immobilize the fractured bone or the sprained ankle, and as Billroth noted many years ago often these severe injuries heal more quickly and more kindly because they have been put at rest, than minor ones in which immobilization has been neglected. Splinting of the wounded part is nature's method of promoting healing. A visit to Sumner Koch's band clinic at the Cook County Hospital, Chicago, shows the value which this surgeon puts on splinting and rest in the care of injured and infected hands. Regardless of the trivial appearing character of a wound, rest, usually best obtained by splinting favors repair and in so doing discourages infection. Many times we see a sutured wound of the hand which has not been splinted or protected from injury become infected, and not infrequently this infection will subside if the hand is simply immobilized on a splint. It is, of course obvious that the contaminating organisms are already present in the wound and that under favorable circumstances the cells can deal with them. If however, the trauma of motion with its accompanying disturbance of healing and opening of avenues for invasion is added, the bacteria may be more than the tissues can cope with.

Healing tissues require an unimpeded blood supply because not only is proper nourishment necessary to the reparative process, but there is strong evidence that the stimulant to repair as well as antibodies for combating infection are products of or result from the break down of white blood cells. The importance of good blood supply is exemplified in numerous instances which we can all draw from our experience. It is a common observation that wounds about the face heal very kindly and may even be sutured at the end of from twenty to twenty four hours with a good chance of primary repair. Hansen has studied 1,000 in-

juries and classified them according to location and the nature of the healing. His criteria for primary healing were very strict, only wounds which were clean and dry and completely healed in seven days were considered to have healed by primary intention. Slight stitch abscesses or slight delay beyond seven days, as well as more extensive infections and disturbances were classed as secondary healing. In wounds of the head and neck primary healing was obtained in nearly 97 per cent if the care was given within twenty four hours. For wounds of the upper extremity, 84 per cent healed per primam if cared for within six hours, 50 per cent if the six hour limit was exceeded. Wounds of the fingers, including disarticulation, if cared for within six hours, showed primary healing in 80 per cent, if after six hours in 66 per cent. Wounds of the lower extremity treated within six hours showed primary healing in 74 per cent, after the elapse of six hours in 40 per cent. Local infiltration into tissues of which the blood supply is already poor may lead to gangrene, as Priestley has pointed out in the case of diabetes. Koch has stated that one of the factors which contraindicate local infiltration for drainage of infection is the disturbance of local circulation caused by the pressure of the anesthetizing fluids in the tissues. We cannot, of course, be dogmatic about the position in which injured parts be placed in order to favor good circulation. In general, slight elevation seems to be the most favorable position. Wangenstein at Minnesota has shown that even serious infection may be brought under control by simple immobilization and elevation in a plaster cast. However it is conceivable that in some instances a seriously embarrassed circulation to a part may be assisted by having the part slightly below heart level. It does not seem at all unlikely that in the care of certain wounds the surgeon might profitably have recourse to some such measure as pavaex therapy, intermittent venous congestion, or the rocking bed to further healing in such parts as the lower extremities.

One procedure which it has seemed to me secures its beneficial effects by directly supporting the local circulation is the application of a pressure dressing over a wound following repair. Such a dressing prevents the postoperative oozing which is sure to occur after wound closure. It also acts to control the amount of local edema which in itself may be a factor in interference with the adequate blood supply. It also serves as a support to the local vessels and has proved especially valuable in the dressing of granulating wounds in which its effect has been compared by Koch to

that of the Unna boot and other forms of treatment for varicose veins. The pressure however, must be applied with discretion. It must not be applied too tightly lest it shut off the blood supply nor can it be applied too loosely when it has no effect. It must be resilient pressure obtained by the use of large amounts of fluffed gauze or sea sponges. It should be applied evenly over a considerable area above and below the wound but should not be so tight as to lead to edema peripheral to it. In case of granulating wounds in which skin grafts are to be applied the pressure is kept up until the granulations have become sufficiently clean to allow skin grafting. It is remarkable how frequently small granulating wounds epithelize under constant pressure.

Too frequent changing of dressings interferes with the immobilization of the part disturbs the healing wound edges and subjects the wound to possible secondary contamination Unless some definite indication arises the dressings placed on a wound at time of operation need not be disturbed until the sutures are to be removed If we can wait this long we are often agreeably surprised by the kind way in which healing has taken place The surgeon seldom gains anything by the inspection of a wound except the satisfaction of his curiosity Of course if symptoms of infection arise if we fear subcutaneous hemorrhage has occurred or if we are dealing with an already infected wound the situation is different Changing of dressings has come to be almost a ritual which satisfies the urge to do something for a wound There is no more reason for changing dressings every day on a clean wound than there is for removing splints every day from a fracture It is equally obvious that in the care of infected wounds particularly in the early stages before localization frequent changes of dressing and the disturbances which go with them are harmful When drainage has been established daily dressings for the purpose of cleansing the area and removing the products of infection should be done under aseptic precautions and with gentleness

The first five or six days following wound repair are the critical days. During this time the lag period or exudative phase of wound repair, the stage is being set for the abrupt onset of fibroplasia. Necrotic tissue is being liquefied and removed, bacterial contaminants are being dealt with, and an increasing local resistance to bacterial invaders is developing. The tensile strength of the wound during this period depends almost entirely upon the sutures and the relaxation obtained by rest and splinting. Rest and avoidance of unnecessary manipulation are therefore par-

ticularly essential to proper healing during the exudative phase. That the wound is more susceptible to infection during this phase of wound healing and that for this reason alone dressings should be avoided for at least five or six days has been shown by the experiments of Du Mortier. Virulent staphylococcal cultures rubbed into sutured wounds led to infection with decreasing frequency and diminishing virulence up until the fifth postoperative day, after which they were unable to gain a foothold even in the holes left by removal of the sutures.<sup>1</sup>

There are a certain number of general factors which have a direct or indirect effect upon wound healing. Carrel has shown that healing of wounds occurs at a rate inversely proportionate to age and other investigators have confirmed this observation. We are all familiar with the delayed healing that may occur in the aged but we all know also that healing does occur in the aged as well as the young and that often the diseased condition rather than age alone is the more important. Certain diseases such as diabetes and nephritis retard healing but by what mechanism we are not always certain. Frequently the circulatory disorders which may be present are the most potent factor since it is general experience that the diabetic may be subjected to operation as may the non diabetic provided the condition is of non diabetic origin and healing may be confidently expected by first intention. Acute and chronic anemia unquestionably may interfere with wound healing through what mechanism we cannot be certain though we must think of hypoproteinemia and oxygen and nutritional want. Dehydration of even moderate degree has

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a marked inhibitory effect upon repair in general and experimentally has been shown to lead to striking weakness in healing wounds.<sup>1</sup> For optimal healing a good fluid balance should be maintained, salt and glucose and whole blood transfusions will often lead to the healing of sluggish ulcers and infections especially in children with granulating infected burn ulcers.

Distant infection is said to have a deleterious effect on wound healing and this statement is supported by Carrel's experimental work. How significant this factor is I cannot say. It is undoubtedly advisable to postpone elective operative procedures in patients with infections elsewhere. We are all familiar however with accessory drainage incisions which persist for weeks after the primary operative incision has closed, and it has been the experience of all of us with patients with multiple wounds to have all but one heal quickly by primary intention.

Two particular factors deserve special reference since they have been quite exhaustively studied and very definite clinical evidence supports critical experimental work. One of these is the effect of proteins on wound healing which was first suggested by the experimental work of Carrel later by more direct experiments of Clark, Harvey, *et al*, and recently by Ravdin and his coworkers at Philadelphia. Carrel showed that the stimulus for wound healing was a protein, probably an embryonic type of protein, not present in all tissues but apparently occurring in white blood cells, tissue wandering cells and connective tissues. Clark found delay in healing in animals fed on low protein diets. Harvey in experiments on guinea pigs showed that with high protein diets wound healing progressed about the same as with low protein diets. The latent period was the same, however, once fibroplastic proliferation started it proceeded more rapidly in animals on a high protein diet. Ravdin and his group at Philadelphia have made both experimental and clinical observations on blood proteins in wound healing. They have shown that with hypoproteinemia healing is retarded or may even cease and that when the protein is brought up to normal by the use of lyophilic serum normal healing takes place.

Vitamin C deficiency as a cause for disturbances of wound healing was suggested by Sokolov in a study of postoperative wound dis-

ruption. This surgeon found that wound disruption occurred with greater frequency during the late winter and early spring months and expressed the idea that this was due to Vitamin C deficiency since the patients from whom the statistics were drawn were of the northern races whose Vitamin C intake was much curtailed during winter. Experimental studies and clinical investigations have definitely borne out Sokolov's suggestion. Lanman and Ingalls observed a case of an infant with congenital atresia of the bowel in whom wound disruption followed operation. Studies of the tissue after death showed typical changes of scurvy. They have found that many infants show subnormal Vitamin C blood content. Experiments on guinea pigs placed on diets low in Vitamin C showed that wounds in the scorbutic animals healed poorly, more slowly and with the development of less tensile strength than in normal controls. Histological studies of the wounds revealed changes typical of scurvy, i.e., deficiency of collagen formation, the typical pathological picture as described by Wolbach. Taffel and Harvey have recently repeated the experiments and have found that in the scorbutic pigs there was definite delay in the development of normal tensile strength. Individuals with obstructive lesions of the gastrointestinal tract who have been on deficiency diets because of various reasons (peptic ulcer, gastro intestinal carcinoma, and other types of cachexias and food deficiencies) are the ones most frequently subject to wound disruption. Such patients as has been shown by Youmans will often show low Vitamin C content in the blood even though there are no actual signs or symptoms of scurvy. In such patients efforts should be made before operation to see that blood ascorbic acid is brought up to normal levels.

Brief reference might be made to certain substances which are applied to infected wounds with the purpose of stimulating healing. I do not have reference to the use of antiseptics for the purpose of reducing the bacterial invaders. Experimental studies by Smelo and Anderson have shown that, except for the use of zinc peroxide in the control of microaerophilic streptococcal infection, the use of antiseptics as topical dressings seldom if ever reduced the bacterial flora and had absolutely no effect upon the rate of wound healing. However following the suggestion that the natural stimulant to wound repair seems to be a protein in which the sulphydryl radical is important, various substances containing this radical have been used with enthusiastic reports by the users. The use of maggots in the cleaning up of infected

<sup>1</sup>Bird and Mackay have studied experimentally the effect of dehydration on the tensile strength of wounds in the stomachs of rats on limited water intake. They have shown that during the early days of healing the wounds in the dehydrated animals are on the average weaker than in the controls and that it took about the entire experiment the total strength of the gastric walls in the dehydrated animals is less than that in the normal rats.

wounds containing necrotic tissue had been thought to be due largely to the fact that the maggots consumed the necrotic tissue. Robinson was able to show that the action of maggots was due partly at least to allantoin which was excreted into the wound and that allantoin could be substituted for maggots. This observation has since been confirmed from many sides. Robinson subsequently found that urea also excreted by the maggots was efficacious in cleansing wounds of necrotic tissue and appeared to act as a growth stimulant. Numerous reports on the beneficial effects of urea on wound healing have appeared from this country and Europe and it seems not unlikely that there may be some merit in it.

The question of the effect of the local application of various vitamins upon wound healing has been subjected to clinical and experimental study, although as yet the results are not consistently in agreement. Loehr in 1934 reported that the local application of cod liver oil on burns resulted in more rapid healing and subsequently cod liver oil dressings were applied to other types of wounds and injuries and have met with wide usage especially in Germany. It was found that vitamin free oils did not speed up healing and it was assumed that the vitamins particularly certain essential fatty acids (Vitamin F) were the active agents and it was believed that there was a synergistic action between Vitamin A and the fatty acids. However workers in this country have not been able to substantiate the conclusions concerning the effect of cod liver oil. Puestow, Poncher and Hanumatt from a recent study of burns treated with vitamin containing ointments found a definitely increased rate of healing with such treatment but did not think that the vitamins could be held responsible for the action of cod liver oil. A similar conclusion was reached by Getz in a study of healing of tuberculous ulcers in guinea pigs. While it appears that cod liver oil contains some substance or substances beneficial to wound healing there is still no agreement as to the actual effective agent. Whatever may be the final conclusion regarding the efficacy of cod liver oil on wounds there is no doubt but that as Burgass has pointed out rest protection from injury and avoidance of frequent dressings may be important factors and here may well be Loehr's most important contribution.

Many of the general factors in wound healing have been known since the time of Celsus and while the conditions themselves are better understood and the modern surgeon with the aid of the laboratory and the internist can successfully combat most of them we still do not know the exact

mechanism of their interference with the healing of tissues. The diabetic may be safely subjected to operation as may the non diabetic. We have fairly accurate methods of determining Vitamin C deficiency though in this day and age of a vitamin minded public it is questionable if this complication often arises. Should it arise however we have means at hand to remedy it. Except in emergency operations or operations upon seriously ill cachectic patients the modern surgeon usually sees to it that the patient is in the best of general physical condition. It has seemed to me that it is the exceptional case in which the cause for the development of disturbances in healing particularly infection is to be sought in general rather than in local factors.

In resume the factors which interfere with wound healing may be classified into those which act locally at the site of the wound and those which act in a more general way through the organism as a whole. The local factors which interfere with wound healing are infection (which is too frequently introduced secondarily or encouraged by disregard for the tissues) mechanical and chemical trauma devitalized tissue hematomas and hemorrhage large amounts of foreign material inadequate closure suturing of tissues under tension lack of immobilization disturbances of circulation and too frequent changes of dressing. The general factors that have been mentioned are anemia diabetes nephritis, hypoproteinemia and the lack of Vitamin C. There are of course many others. However, it would seem that in the vast majority of instances the cause for disturbances of wound healing is to be sought in local or extrinsic factors over which the surgeon has control. Strict observance of the principles of aseptic and atraumatic surgery at all times in the handling of wounds, accidental or operative must be practiced if we expect to obtain clean wound healing.

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# ABSTRACTS OF CURRENT LITERATURE

## SURGERY OF THE HEAD AND NECK

### HEAD

MacFee W F Malignant Tumors of the Salivary Glands Report of 27 Cases *Ann Surg* 1939 109 534

In the great majority of cases malignant tumors of the salivary glands are epithelial in origin and are classified as carcinomas. They probably arise in displaced embryonal cells of the salivary glands or more likely from the buccal epiblast with some underlying mesoblast.

Salivary gland tumors if derived from primitive embryonal tissues may reasonably be expected to show a considerable diversity of structure and this indeed is the case. A number of types are found in both the benign and malignant groups. The common types of malignant tumors are (1) mixed tumors with malignant changes (2) tumors composed of small cells of the basal type with either solid or cylindromatous arrangement (3) papillary cystic tumors (4) adenocarcinomas (5) squamous cell carcinomas and (6) a somewhat heterogeneous group of tumors usually rather undifferentiated and not conforming to any of the preceding classifications.

The tumors behave clinically somewhat as their cellular structures would indicate. Metastatic lesions generally follow the pattern of the original tumor. In the case of the malignant mixed tumors the secondary implants usually are found to appear in simpler form.

The tumors exhibit a wide variety of histological structure and of clinical behavior. They affect the sexes in nearly equal numbers and may occur at almost any age. The youngest patient in the present series was sixteen years old and the oldest sixty-eight years; the majority of the patients appeared to be in middle life. Some tumors apparently arise as malignancies while others appear to be the result of malignant changes in primarily benign tumors. The disease may run a fatal course within a few months or the patient may survive for many years with the disease. When metastasis occurs the regional lymph nodes are occasionally involved but not with great frequency. The incidence was approximately 15 per cent in the present series of 27 cases. Metastasis to the lungs is perhaps more common than is generally recognized. Eleven patients in this series had roentgenological examinations of the chest. Of these 5 showed convincing evidence of pulmonary metastasis—an incidence of 72 per cent of those examined and approximately 30 per cent of the entire series. A roentgenogram of the chest should be taken routinely in the study of these cases.

The development of metastatic lesions does not appear to bear a close relationship to the duration of the disease. The tendency of malignant salivary gland tumors toward remote metastasis with relatively infrequent involvement of the regional lymph nodes is in marked contrast to the behavior of other malignant epithelial tumors arising in the same general vicinity. Carcinoma of the tongue and buccal mucosa for example regularly metastasizes to the cervical lymph nodes and rarely extends beyond them.

The symptoms are few and are by no means pathognomonic. A small nodule or swelling appears without apparent cause and increases in size usually slowly but sometimes rapidly. As a rule there is no pain when pain is present it is described as shooting or stabbing in character and is referred to the jaw the side of the head or to the ear. A large growth sometimes interferes with motion of the jaw. In advanced cases there is frequently a spontaneous facial paralysis due to nerve involvement. In appearance the malignant tumor cannot be accurately distinguished from one which is benign. The palpation of more than one tumor mass is strongly suggestive of malignancy.

Other conditions which may be confused with tumors of the salivary glands are those affecting the groups of lymph nodes which are intimately associated with these glands. Branchiogenic tumors and cysts and tumors of the jaws as well as various inflammatory conditions are also mistaken now and then for new growths of salivary gland origin.

Histological differentiation of benign and malignant salivary gland tumors is sometimes extremely difficult. A malignant tumor may appear encapsulated and be indistinguishable microscopically from a benign growth. The diagnosis in such cases depends ultimately upon the clinical course of the disease. In the average case of salivary gland tumors the histological diagnosis is made with relative certainty.

Treatment of the malignant tumors is far from satisfactory. Radical surgery frequently carries the handicap of producing facial nerve paralysis when applied to parotid tumors and this occurs in the great majority of cases. In many instances it also fails to eradicate the tumor completely. Radiation has the disadvantage of threatening the integrity of normal tissues especially the skin if given in dosage sufficient to destroy the tumor. The principal complications of radiotherapy are the occasional radiation necrosis atrophic changes in the skin and deeper tissues with postradiation dermatitis or ulcer and

atrophy of the salivary and mucous glands with consequent dryness of the mouth. Heavy radiation is also sometimes followed by facial paralysis. A combination of surgery and radiation appears to have given better results than either of these methods used alone.

The result in a given case cannot be predicted with any great accuracy. The general prognosis can scarcely anticipate the ultimate cure or five year survival of more than 25 per cent.

JOSEPH K. NARAT, M.D.

Lacy N. E. and Engel L. P. Acute Osteomyelitis of the Superior Maxilla in Children. Report of a Case. *Arch Otolaryngol* 1939 29 417

Acute osteomyelitis of the superior maxilla is an unusual disease but it presents a rather typical appearance in infants. While a gastric disturbance may be the first sign of impending trouble the first indication of the location of the disease is the edema and swelling of the eyelid without involvement of the conjunctiva or lacrimal sac. Swelling of the periorbital tissue may be great enough to cause marked exophthalmos. There are redness, swelling, pain and tenderness over the cheek of the infected side. The inflammation goes on to suppuration and rupture occurs usually below the inner canthus at which site a discharging fistula remains. Marked swelling and redness over one half of the hard palate are equally common. Localization also occurs in the alveolar process of buccal fold in the region of the canine fossa.

Early spontaneous rupture or operative procedures establish drainage of the infected bone and result in discharging fistulas. These multiple sinuses show a characteristic discharge of purulent material containing small particles of bone or sequestra and sometimes unerupted teeth. The fistulas are easily probed. As a rule there is a thick purulent discharge from the nose although this finding has not been described in some of the reports of other observers. The temperature is most often irregular. Anorexia may be noted and there is difficulty in feeding because of the soreness of the mouth, the swelling of the sucking pad and the presence of pus in the nasopharynx and nose. The outcome of the disease may be complete healing with persistent sinus formation, development of secondary foci or death.

Lacy and Engel believe that their case lends itself to the proof of the hematogenous origin of osteomyelitis of the superior maxilla. While the authors do not draw any definite conclusions they indicate the advisability of early operative intervention. Drainage should be established primarily through the mouth and secondarily through the antrum of Highmore. Whenever possible drainage through the skin of the cheek overlying the superior maxilla should be avoided even though a fistula should be present. Finally maxillary sinusitis is a complication of the osteomyelitis rather than a cause of it.

NOAH D. FABRICANT, M.D.

## EYE

Leech V. M. and Sugar H. S. The Reduction of Postoperative Complications in Cataract Operations with Corneoscleral Sutures. *Arch Ophth* 1939, 21 966

In an effort to evaluate the place of the corneoscleral suture in cataract surgery an analysis was made of the cases operated on at the Illinois Eye and Ear Infirmary. These cases were divided into three groups: (1) those in which conjunctival flaps were used without sutures; (2) those in which there were conjunctival flaps with sutures; and (3) those in which corneoscleral sutures were employed. One hundred and fifty cases in each group were tabulated. The following table gives a summary of the comparative figures.

TABLE I—COMPARISON OF COMPLICATIONS IN THE THREE GROUPS

	Prolapse of Iris and Vitreous Incarceration of Iris	HypHEMA	Anterior Chambers Not Reformed
Group 1	11 cases (8.0%)	9 cases (6.0%)	11 cases (7.3%)
Group 2	10 cases (6.6%)	17 cases (11.3%)	9 cases (6.0%)
Group 3	6 cases (4.0%)	7 cases (4.6%)	4 cases (2.6%)

The authors believe that their statistics indicate the following advantages of the corneoscleral suture:

1. The number of postoperative prolapses are reduced and if prolapse should occur it is smaller.
2. The occurrence of hypHEMA is reduced.
3. The anterior chambers are formed earlier.
4. Prolapse of the vitreous is eliminated.
5. If the vitreous is lost during the operation the wound is closed securely after delivery of the lens and no further loss is feared.
6. When the ends of the suture are drawn taut firm apposition of the surfaces of the wound is obtained even before tying which allows irrigation to be done when indicated and toilet of the wound to be completed in safety.
7. In cases in which patients cough, vomit, or become violent the eyes are much more safe.

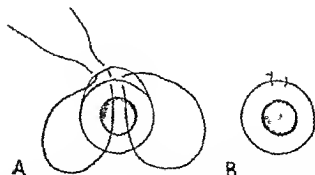


Fig. 1. A suture in position ready for corneal section (The flap in this drawing is somewhat larger than is generally made) B appearance of suture at completion of operation.

8 Earlier and freer postoperative movement is permissible a factor especially important in older patients

9 It is especially advantageous for younger surgeons whose incisions may be less perfect

Because of the small percentage of patients returning for refraction it was not possible to make an adequate comparison of visual acuities or postoperative astigmatism. No disadvantages from use of the method were seen. WILLIAM A. MANN, M.D.

## EAR

Mill W. A. Mollison W. M. Watkyn Thomas Howarth W. and Others. Discussion on Modern Surgery of the Labyrinth. *Proc. Roy. Soc. Med. Lond.* 1939 32 831

Mill states that at the present time surgery of the labyrinth is concerned with the treatment of labyrinthitis in its various forms, meningitis, Meniere's syndrome and otosclerosis.

Meniere's syndrome involves recurring attacks of vertigo, perhaps associated with vomiting and falling deafness gradually increasing and tinnitus. The indications for operation in this disease are severe and often repeated vertigo, deafness of a high grade and fixation of the stapes by osseous formation. A review of the various forms of operative intervention for this condition includes opening of the external semicircular canal, opening of the canal and the placing of one end of a fine silk suture in it while the other end is placed between the dura and the cranium, the injection of alcohol into the labyrinth, the use of diathermy to destroy the labyrinthine function, opening of the superior canal, division of the whole or a part of the eighth nerve, drainage of the saccus endolymphaticus and rupture of the ductus endolymphaticus. Although Meniere's syndrome is being treated in a number of different ways at the present time, no individual procedure is completely satisfactory.

Mollison says that the various partial or complete labyrinthectomies are obsolete. These operations for acute and chronic labyrinth inflammations might be called for in rare cases of acute streptococcal invasion of the labyrinth, but in the future, prompt and continuous lumbar puncture may replace operation. There are cases in which suppuration around the internal ear results in sequestration of the whole labyrinth and then operation is performed to remove the whole labyrinth. Opening of the labyrinth is advised by some in certain cases of complications after fracture of the temporal bone. The attempt to restore hearing in otosclerosis has turned the attention of a number of surgeons to the semicircular canals. The external posterior and superior canals have been opened and the fistulas covered with various substances. Keeping the fistula open has been a great problem; it is desirable that a simple and certain method be found. Otology may then hope to live down its reputation for failure to do anything for deafness.

Watkyn Thomas makes the following observations:

The only indication for transabyrinthine drainage was invasion of the meninges through the labyrinth that is a meningitis secondary to a suppurative labyrinthitis. The indications for labyrinthine intervention in otosclerosis were still very doubtful. The gravest suspicion was aroused by an operation on one ear which seemed to improve the hearing in the other ear which had not been operated upon.

Howarth says it was a question whether fenestration of the external canal along these lines had justified the claims made for it. Labyrinthine fenestration ought not to be done unless there is some promise of real improvement in economic hearing that is not just a slight improvement but something appreciable for ordinary conversation. There was some hope in an operation suggested by Sullivan of Toronto. The idea of his operation was to open the superior canal, allow the dura to fall down on the top of the window and close it up in that way without gold leaf or anything of that kind.

Layton states that the bacteriology of otitic meningitis should always be specified. The infection was most frequently caused by the streptococcus hemolyticus but the pneumococcus was sometimes found. The other group of cases of otitic meningitis was that with pre-existing active disease from organisms from the external auditory meatus.

According to Scott the historical review of this subject might include the names of Wallace, Marage, Buzzard, West, Jansen and Miligan.

Woodman observes that the operation on the labyrinth for acute sepsis was a trying procedure. The organisms lay in the greatest profusion at the point where the infection entered the dura.

Lambert says that certain neurological conditions, notably tumors of the cerebellopontine angle, are frequently diagnosed as Meniere's syndrome.

Hall makes the statement that the problem was not whether the otosclerosis operation was justifiable or could improve hearing for that had been proved on many occasions, but how the improvement could be maintained and that seemed to be a technical problem.

Negus says that if the problem were discussed with a plastic surgeon the opinion would be given that practically all operations so carried out were doomed to failure unless an epithelial surface could be turned so as to face inward.

Tumarkin says that the stapes ought to be easy to extract together with the incus by means of a transmeatal atticotomy. The foramen ovale could then be covered either by a sliding flap or a skin graft and would be far less likely to stenose than any artificial opening that might be made into a semicircular canal.

The president of the discussion maintains that a labyrinthine operation should be performed if there were signs of labyrinthitis and the cerebrospinal fluid indicated the presence of meningitis.

NOAH D. FABRICANT, M.D.

## NOSE AND SINUSES

Patterson N External Operations on the Frontal and Ethmoidal Sinuses *J Laryngol & Otol* 1939 54 235

Patterson believes that operations on the nose should, when possible be avoided. Extensive operations are frequently performed when there is no possible justification for them. In general his observations refer to cases in which gross inflammatory or polypoid changes are present in the mucous membrane lining of the cavities concerned. These changes are frequently accompanied by the accumulation of purulent material.

It is often difficult to ascertain whether the disease is located mainly in the frontal or in the ethmoidal cells. Therefore the author regards it advisable during the period of investigation to view any case as one of fronto ethmoidal disease. When a full exposure is made it is often discovered that both the frontal and ethmoidal cells are involved although sometimes the disease is located solely in the ethmoid. It is extremely unlikely that the frontal sinus is affected alone. Not infrequently there is accompanying disease in the antrum and sometimes in the sphenoid sinus.

Even in very acute cases there should as a rule be no undue haste in resorting to surgery. Pain which may be devastating involvement of the soft parts over the frontal sinus, an external fistula, signs pointing to orbital or intracranial extension, general ill health as the result of septic absorption, the presence of nasal polypi associated with chronic ethmoidal suppuration or the unsuccessful removal of the polypi by intranasal methods may point to the advisability of an external operation. An operation on the ethmoid may prove the key to the cure of a suppurating frontal sinus.

Every effort is made to eliminate as far as possible any subsequent scarring or deformity. There are only two regions where incisions are made, one in the neighborhood of the supra orbital ridge, the other in the cheek. The frontal incision passes along the supra orbital ridge and corresponds to the center of or lies just below the hairy eyebrow which should be cut but not shaved prior to the operation. The ethmoid incision begins about  $\frac{1}{4}$  in below the level of the inner canthus at the upper end of a sulcus or natural fold which can generally be seen passing outward and downward into the cheek. This incision is about an inch in length.

Through the frontal incision the frontonasal duct can be explored and the anterior ethmoidal cells opened up or removed. The question as to what kind of operation should be performed on the frontal sinus depends to a large extent on the severity of the disease, its duration, the condition of the lining membrane and bony walls and the contents and size of the sinus. The nature and extent of the operation depends on anatomical and physiological conditions which cannot be fully ascertained till the diseased area has been exposed.



Fig 1 Preliminary incision the blade of the knife lies parallel to the skin so that the latter is cut obliquely. The upper and lower eyelids are temporarily approximated by sutures.

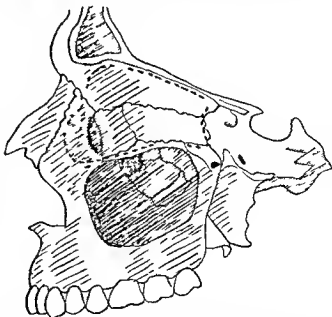


Fig 2 Area enclosed by dotted line indicates the extent of the bone removed. In addition to the ethmoidal area it will be seen to include portions of the ascending process of the superior maxilla, the frontal bone and nearly the whole of the lacrimal bone.

The ethmoid incision should be carried to the roof of the ethmoid which is formed by the frontal bone and lies external to and is continuous with the lamina cribrosa. All mucous membrane as far as possible removed from this plate. By the time the operation is finished no ethmoidal cells should be left unopened and all ethmoidal mucous membrane should have been removed. After this the sphenoidal sinus should be inspected and if diseased a portion of its anterior wall removed.

NOAH D. FABRICANT, M.D.

## MOUTH

Chance, O. The Treatment of Buccal Carcinoma. *Irish J. M. Sc.* 1939 160 145.

From 1930 to 1936 539 cases of intra oral cancer were examined by the author. The cancers were distributed as follows: tongue 271, cheek 43, alveolus 54, palate 48, floor of mouth 75, and fauces 48. Eighty-five and eight tenths per cent of the patients were males and 88.8 per cent were more than fifty years of age. In 237 patients (44 per cent) the cancer was hopelessly advanced and in 372 (57.8 per cent) the glands were enlarged when first seen.

In most cases no sign of syphilis was detected. It appears that active anti-syphilitic treatment has an effect on intra oral growths. They seem to become altered in character so that the exuberant type of malignant ulcer is replaced by an unhealthy thin edged ulceration. Oral sepsis may play a role as a predisposing cause but tobacco does not appear to be related to these growths. The average duration of symptoms was seven and one half months; the longest twenty years and the shortest one day.

The plan of treatment was to clear up oral sepsis as rapidly as possible by the use of mouth washes, extraction of teeth and oral hygiene. Active treatment usually consisted of the implantation of radium needles or else the application of a radium bearing dental splint. Radium applications were carefully planned and checked by special physical dosage charts. X-ray therapy was preferred for tumors of the base of the tongue and advanced or unusually bulky growths in other regions, particularly in the floor of the mouth. During the last few years occasional dramatic results were obtained in advanced cases complicated by large fixed cervical masses. The author believes that external radiation, either with x-rays or radium, will be used more and more frequently in the treatment of buccal cancer. A Chauli contact x-ray plant was occasionally used for superficial growths accessibly placed. The author regards the treatment of the glandular fields as primarily a surgical problem.

Of 18 patients under treatment at least five years previous to this study 18 were untraced, 7 died from unrelated causes and 24 were well. Of 58 patients with tongue involvement who were treated radio- logically only 10 (17 per cent) were alive at the end of five years. Of 32 patients with small early lesions 8 (25 per cent) were alive at the end of five years.

The author pertinently remarks that one pound successfully spent on prevention or on an early diagnosis is worth thousands of pounds spent in elaborate medical apparatus.

MANUEL E. LICHTENSTEIN, M.D.

Engelstad, R. B. The Treatment of Metastases in the Lymph Glands in Carcinoma of the Lips and Oral Cavity. (Die Behandlung der Lymphdrüsenmetastasen bei Lippen- und Mundhöhlenkrebs). *Nord. Med.* 1939 p. 105.

During a three year period 135 patients with cancer of the mouth presented themselves for treatment at the Norske Radium Hospital at Oslo. Among this number were 72 with carcinoma of the tongue and 14 with carcinoma of the lips. Three to six years after the radium treatment 44 (32.6 per cent) with oral carcinomas remained free from symptoms i.e. they were cured whereas 85 patients had succumbed to the carcinoma. Of the patients with carcinoma of the lip 65.2 per cent had been healed. The successful cures were significantly dependent upon the absence of lymph gland metastasis. In the absence of metastasis 65.1 per cent of those with oral and 87.7 per cent of those with lip cancer were cured. In the presence of metastasis the successful cures amounted to only 17.4 and 48.2 per cent respectively.

The treatment of lymph gland metastases at first consisted of telerradium irradiation. When no success was obtained after eight weeks of such treatment a total resection of the lymphatic gland region was performed. The outcome following this form of treatment was considered good as new metastases rarely occurred. However in many of the cases treatment by telerradium irradiation alone led to a disappearance of the metastases.

(HAAGEN) HARRY A. SALZMAN, M.D.

## NECK

Paschoud, H. Hyperthyroidism and Kocher's Successor. (L'hyperthyroïdisme et le successeur de Kocher). *J. internat. de chir.* 1939 4 185.

On the occasion of the retirement of Professor De Quervain from clinical teaching the author presents a bird's eye view of what has been and is being done in the study of hyperthyroidism throughout the world. In Switzerland and particularly in Berne the endemic incidence of goiter compels a knowledge of hypofunction and hyperfunction of the thyroid as well as the problem of thyroid pathology as a whole so that surgeons in these regions are privileged to gain a better insight into many aspects that puzzle workers in other lands. The investigations as to the nature and origin of the active thyroid substance are reviewed from Kocher's study on the iodine content of the thyroid gland from 1895 to the present including the isolation of iodothyronine and the demonstration of tyrosin and thyroglobulin. Twenty years later Kendall isolated crystalline thyroxin and after another ten years the synthesis of this substance was



accomplished. In 1933 it was discovered that the total iodine content of the thyroid gland was superior to that contained in thyroxin and diiodotyrosin was isolated with only an insignificant effect as compared to thyroxin. Thus it was concluded that the thyroid hormone is made up probably of an iodized protein combination of thyroxin and diiodotyrosin. These findings were indispensable for the study of hypofunction and of great value in the study of hyperthyroidism.

As regards the regulatory system the secretory role of the nervous system is still under discussion. As early as 1791 Schreger drew attention to the intermediary role of the thyroid in hindering too sudden and abundant a flow of blood to the brain. Recently Rein has offered evidence that would seem to support this theory.

At present the hormone regulation by the thyrotropic hormone of the pituitary gland in particular is receiving much attention with regard to a direct action upon the cells of the gland and an indirect action dependent upon the integrity of the dienecephalon. Some writers believe that also the sex glands participate in the regulation of the thyroid system and recently sex hormones have been used in the treatment of hyperthyroidism. The effects of cold and diet on the function of the thyroid have been studied.

Important knowledge has been gained as to the site of action of the thyroid hormone. Thus certain effects of thyroxin are inhibited by the barbiturates which have a selective narcotic effect on the dienecephalon. High section of the cord has a similar effect. The schools of Vienna and Budapest are of the opinion that the thyroid hormone can affect the metabolism, bio energy, and blood cholesterol only when the dienecephalon is functioning. As the thyroid also influences other endocrine glands this phase of the subject becomes extremely complex.

Prolonged administration of the thyrotropic hormone causes the appearance in the blood of an antagonistic substance which destroys the hormone effect, a so called antithyrotropic hormone the deficiency of which may lead to hyperthyroidism. In 1904 and 1905 De Quervain emphasized the toxic nature of the lesions of Basedow's disease. The studies on simple non suppurative thyroiditis have thrown new light on the antitoxic role originally attributed to the thyroid.

A hasty survey is made of the many contributions of De Quervain which comprised 69 articles and 1 book. Alcohol was found to have an effect on the thyroid gland very similar to that of Graves' disease. Toxic lesions were distinguished from hyperthyroidism. In 1912 and 1915 De Quervain published his monographs on the surgical treatment of goiter recommending the ligation of the inferior thyroid arteries. Later experiments showed that the venous blood of the thyroid in Basedow's disease was more active than the venous blood of the normal thyroid.

In 1922 appeared the first clinical studies of the basal metabolism and its reactions to thyroidectomy

followed by investigations on the effect of iodine on the basal metabolism and the value of iodine prophylaxis. In 1923 De Quervain contributed his book on goiter with a chapter on hyperthyroidism and a lucid expose of his surgical technique. This was followed by studies of the blood picture in the various functional phases of the thyroid gland and by various contributions throwing light on the physiology and pathology of this organ. Among these may be mentioned the experiments on rats demonstrating increased sensibility to oxygen deficiency following the administration of blood from patients with Basedow's disease. The relation between true Basedow's disease and Basedow's goiter was studied. Iodine Basedow's disease although usually mild may present most severe forms of hyperthyroidism. The clinical studies on basal metabolism by De Quervain and Pedotti extended to all forms of thyroid pathology. It was discovered that the basal metabolism was influenced much more by extensive resections than by rest cures and ligatures. As a working hypothesis he admitted the conception of dysthyroidism but could find no justification for changing the conception of hyperthyroidism as presented by Moebius and Kocher. At the International Goiter Conference in 1927 he disapproved of the indiscriminate use of organotherapy in cases in which careful examination would reveal no endocrine disturbance. He directed a statistical survey of Basedow's disease in Switzerland in an attempt to determine the role of iodine medication in the development of true Basedow's disease. He studied the effect of insulin shock in hyperthyroidism but found no reason for assuming a synergy between insulin and the thyroid hormone. In 1931 he published the results of his personal experiments on the oculocardiac reflex as affected by thyroid conditions but concluded that the form of the reflex could not be used for differential diagnosis. The different results following iodine therapy of toxic adenoma and iodine Basedow's disease in America as compared with results of such therapy in regions of endemic goiter are stressed.

In 1932 De Quervain and Abelin contributed a section to the *Handbuch der biologischen Arbeitsmethoden* in which an experimental study of the function of the thyroid was made by all available methods (including the acetone test, the Reid Hunt test, the glycogenic test, tadpole growth, phagocytosis, the colloidal chemistry of the blood, the Kottmann reaction, Starlinger's citrated blood test, basal metabolism tests, and studies of the blood vessels and the minute volume in Basedow's disease) and in which the value of various thyroid preparations was presented. In 1932 De Quervain announced that the clinical symptoms of thyroid suppression were the result not only of deficient secretion but of antagonistic secretions.

At the second international Goiter Conference at Berne in 1933 Josselin de Jongh separated the hyperthyroidoses from true Basedow's disease. He did not feel that classification of the hyperthyroidoses as toxic

adenoma was justifiable. Basedow goiter should be distinguished from hyperthyroid goiter because one has to deal with a diffuse parenchymatous goiter which may be filled to varying degrees with colloid. This colloid content is increased by iodine therapy. The lymphoid tissue is increased more in Basedow goiter than in hyperthyroid goiter. Josselin de Jongh considers the hyperthyroidism as pure hyper functions in which iodine has an exacerbating effect whereas in true Basedow's disease the function is in complete and iodine may have a favorable if transitory effect. At this conference De Quervain reviewed the work of Josselin de Jongh, F. P. Pinner and Sturm. He stated that in ten years he had seen personally 33 cases in which iodine treatment had led to the development of more or less severe Basedow's disease.

In 1936 De Quervain compiled a history of iodine in the physiology and pathology of the thyroid gland. According to De Quervain iodine Basedow's disease is almost a classic Basedow's disease with slight or no exophthalmos but in which the gland does not always present the symptoms of hyperfunction in spite of the clinical evidence. In his opinion iodine by permitting the maintenance of morphological and functional integrity of the thyroid in spite of the presence of goiter exerts a physiological prophylactic and often therapeutic effect.

In 1937, at the Conference of the Medical Society of Geneva, De Quervain discussed the surgical treatment of the hyperthyroidism. In 1938 he reviewed the progress in study of the thyroid for the past fifty years. More recent investigations include a study of the antagonism of thyroxine to Vitamin A, the possible utilization of short wave therapy in hyperthyroidism and many other works directed or instigated by De Quervain. There is not a single phase of hyperthyroidism to which De Quervain and his school have not contributed by their clinical and experimental work. In all his conclusions De Quervain has confirmed and developed the ideas of his master Theodor Kocher.

LUISE SCHÄNCHER MOORE

Debeyre A. and Gineste P. J. Experimental Goiters and the Anatomophysiologic Classification of Goiters (Goitres expérimentaux et classification anatomophysiologique des goitres). *Ann d anat path* 1939 16 267

The authors discuss in detail the morphological tests of thyroid activity as developed by Florentin Aron Oskels and Dellys dividing them into four groups according to their respective values:

1. Hypertrophy of the vesicular epithelium and the multiplication of the chromophobe vacuoles constitute the two major tests of hyperthyroidism. This condition may be confirmed by a number of physiological factors such as an increase of the basal metabolic rate, elevation of the total blood iodine with thyrotoxicemia and diminution of the thyroid iodine level.

2. The second group of tests is of equal value but more difficult of interpretation: the appearance

of intravascular epithelial vegetations, the demonstration of mitoses and direct divisions and the presence of pluristratified epithelium or of massive desquamations of epithelium in the follicular cavity. Other signs are constant but can be demonstrated only by special techniques. Among these may be mentioned hypertrophy of the mitochondria and of the Golgi apparatus. Finally certain signs are very reliable but only transitory and have to be demonstrated within a certain limited time after onset of the stimulation. Such are the appearance of the oxidase granulations of Oskels in the initial stages of thyroid secretion and the presence of colloid intra-cytoplasmic vacuoles, the rapid disappearance of which after two days of stimulation with the thyrotropic hormone was demonstrated by Aleschin in 1935.

3. From an experimental point of view tests of the third group such as tests of thyroid hypertrophy cannot be taken as true tests of activation of the glandular secretion. Large goiters may be present in hypothyroid syndromes and marked vasodilatation may be associated with hyposecretion in certain experimental conditions.

4. In the fourth group are placed morphological tests the value of which has been disputed such as the demonstration of Bensley vacuoles, the existence of which has been questioned and the multiplication of full cellular islets, the secretory activity of which appears diminished. Such formations have been noted also in glands subjected to prolonged stimulation.

The conditions permitting an assumption of hyposecretion include flattening of the vesicular epithelium, atrophy of the mitochondria and Golgi apparatus and of the nucleus, abundant and dense intravascular colloid without vacuoli of resorption and numerous full cellular islets. According to the predominant vesicular or insular structure the gland takes on the aspect of colloid goiter or of fetal adenoma of Woeffler.

Following a detailed discussion of the histophysiological conceptions of the thyroid secretion and the physiopathology of the phenomena of stimulation in the thyroid gland and their application to the anatomical classification of goiters, the authors submit a tabular classification of goiters based on the conception of a functional cycle of the thyroid cell comprising three successive stages which are the resting stage or interphase, the stage of accumulation and the stage of resorption.

There are thus two types of goiters:

1. Goiters due to interruption of the thyroid cycle which result from a dissociated stimulation and determine the predominance of one of the developmental phases of the thyroid cell over the other stages of its evolution.

a. Blockage at the stage of accumulation of colloid caused by an exaggerated distention of the vesicles, the epithelium of which remains low, an indication of diminished activity. This causes colloid and cystic goiters.

- b Blockage at the stage of functional rest, during the interphase leads to an increase in the number of Wolffian cords the insular structure progressively replaces the vesicular structure and the goitrogenic stimulus acts exclusively on the proliferating activity of the thyroid elements. This causes the fetal adenoma of Wolffian.
- c Blockage at the stage of resorption will produce not goiter but an atrophy of the thyroid gland which succeeds a transitory phase of hyperthyroidism.
- 2 Goiters due to acceleration of the cycle which are the result of definite stimulation of the thyroid function which produces
  - a A paracrymatous proliferation by increasing the number of mitoses
  - b An equilibrium between the effect of accumulation and the effect of resorption. Thus a lasting hyperthyroidism is established the clinical and pathological anatomical expression of which is Basedow goiter.

From a histophysiological standpoint the goiters due to blockage of the cycle are accompanied by thyroid hyposecretion and the goiters due to acceleration of the cycle are accompanied by hypersecretion. The experimental findings do not correspond strictly with clinical observations not infrequently one encounters colloid goiters or adenomas of Wolffian not accompanied by apparent signs of hypothyroidism. Possibly one must in such cases apply the notion of a total mass of thyroid tissue. Each weight unit of goiter functions infinitely less than an equal quantity of normal thyroid parenchyma but as the goitrous mass is so much more voluminous the patient presents a subnormal metabolism and may be said to be hypothyroid anatomically but not physiologically.

Therapeutically it should be borne in mind that every goiter due to blockage of the cycle whether in diastole (phase of accumulation) or in systole (Wolffian phase of functional rest) represents a considerable reserve of prehormone or cellular elements. Mobilization of these reserves by restoration of the cycle will lead to basedowification of the goiter. Possibly intensive medication in goitrous subjects may have such an effect. It would seem advisable to refrain in such cases from the administration of thyroid stimulating substances such as adrenalin sympathetic stimulants large doses of Vitamin D, or genital hormones.

The favorable effect of iodine in hyperthyroid conditions may be explained by this conception of a thyroid cycle. It seems probable that the increase in iodemia indispensable for intravascular accumulation of colloid produces a blockage in the phase of accumulation either by stimulation of the pneumogastric nerve or of the cyanophile cells of the anterior lobe of the hypophysis (Franck), or perhaps by some complex endocrine negative mechanism in which these two elements intervene.

EDITH SCHIANDEL MOORE

Hurley T E V The Goiter Problem with Special Reference to Etiology and Treatment *Australian & New Zealand J Surg* 1939 8 340

The thyroid is concerned with the utilization of the oxygen in the tissues. It is closely coupled with the production of thyroxin for which an adequate supply of iodine is essential. If thyroxin is used at a higher rate than the thyroid is able to supply it or if the raw materials are lacking, hypertrophy of the cells occurs and goiter develops. If the demands are prolonged and iodine is deficient the thyroid secretes an iodine deficient product which may cause disordered physiological function. The administration of iodine will restore normal balance if the changes are mild and at least a temporary regression if they are severe. Continued administration of iodine aggravates the symptoms. The cause for this is unknown.

The essential cause of goiter formation is probably uniform the various types of goiter are manifestations of various stimuli.

In smooth adolescent goiters iodine is indicated under careful observation for short periods with other medical measures such as rest sedation, and the removal of foci.

Iodine will not cure the nodular enlargements which follow the smooth diffuse enlargement. It should never be used in these except as a preoperative measure. In goitrous regions iodized salt may be used as a prophylactic.

The most effective treatment for toxic goiter is a partial or complete removal of the gland. During pregnancy and the menopause careful medical treatment including x ray treatment may suffice but operation should be reserved for cases which develop toxic changes. Congestive failure will be much relieved in older patients with adenomatous goiter (the thyroid disease may be masked by the cardiac signs).

Gas and oxygen anesthesia is preferable and in 90 per cent of patients one stage operations can be carried out. Farnaldehyde or avertin is useful as a basal anesthetic.

If the operation is carried out in two stages about ten days should intervene. Occasionally the relief is marked by operating on one side only. The operation should be radical. Myxedema can be controlled by thyroid extract.

FRED S. MODERN M D

Rawlins, A G Operative Procedure for the Relief of Stenosis in Double Abductor Paralysis of the Larynx *Laryngoscope* 1939 49 260

The treatment for stenosis in bilateral abductor paralysis of the larynx resolves itself into two fundamental procedures emergency treatment, when necessary to save the life of the patient and treatment directed toward the production of a permanent and adequate airway through the natural air channels. The emergency measure is immediate tracheotomy while medical treatment should be directed toward any systemic disease causing the paralysis.



Fig. 1. Appearance of larynx after operation. Notice the external and low position of the left cord.

Sufficient time should be allowed for functional recovery of the larynx before any type of surgery is considered.

When the recurrent laryngeal nerves have been cut accidentally, suturing the cut ends should when feasible be the logical treatment. Unfortunately, this procedure has had little success. Paralysis due to pressure from without or to scar tissue contraction following thyroid or other neck operations necessitates elimination of the tumor causing the pressure or release of the nerves from the scar tissue. Cutting the recurrent laryngeal nerves in order to produce a cadaveric position of the cords has met with no success.

In paralysis due to central nervous system pathology or to neuritis from diphtheria, influenza or lead poisoning or in any case in which atrophy and

fibrosis of the posterior crico arytenoid muscles have developed, some non physiological surgical treatment may be necessary. It is with this type of case that the author is concerned. Elastic operations to widen the anterior portion of the larynx, surgical removal of the cords and external transplantation, ventriculectomy, and simple removal of the arytenoid cartilages alone are procedures that have not given satisfactory results. Ventriculocordectomy has been fairly successful only in the hands of a few.

Working on Lore's theory, the author modified an operation on cadavers in which Lore did two fundamental things: removal of the adductor muscles that make up the cord, and removal of the entire arytenoid cartilage. This procedure was performed by Rawlins on a woman with bilateral abductor paralysis who some forty years before had developed a very sore throat probably from diphtheria. Following this she was very hoarse for about a year and one half. Her voice gradually returned to normal but concurrently difficulty in breathing developed. Six years later marked dyspnea came on gradually becoming so severe that the patient almost died during an acute upper respiratory infection.

On examination the larynx revealed both cords in the median position and on the same level. Preliminary tracheotomy was done and the larynx well exposed by means of a laryngofissure. Making a horizontal incision just above the left cord from the anterior to the posterior commissure, the author elevated the mucosa over and below the cord on the left side. Starting at the anterior end and working back to the arytenoid cartilage, he removed the thyro arytenoid muscle and other tissues making up the cord down to the perichondrium of the thyroid cartilage. The arytenoid cartilage was then dissected free and the arytenoid removed.

In paralysis similar to this case, the author believes this operation should be the method of choice because of the simplicity of the procedure, the ease of postoperative care, the short duration of convalescence, the elimination of a bilateral operation, and the assurance of a good airway.

NOAH D. FABRICANT, M.D.

# SURGERY OF THE NERVOUS SYSTEM

## BRAIN AND ITS COVERINGS, CRANIAL NERVES

Rossier J. A Contribution to the Study of Cranio cerebral Injuries. The Pathology of the Subdural Space (*Contribution à l'étude des traumatismes crâniocérébraux. Pathologie de l'espace sous dural*) *J de chir* 1939 53 625

Rossier has made a review of the recent literature pertinent to the subject of the surgical pathology and pathogenesis of varying forms of subdural hemorrhagic lesions. He is in agreement with most American author that trauma is the usual and major factor in the production of such lesions, whether they prove to be (1) an encysted collection of cerebrospinal fluid between the arachnoid membrane and the dura (following a rent in the arachnoid membrane?) (2) a diffuse spread of bloody cerebrospinal fluid (3) a recent hemorrhage of fresh pure blood or (4) an old subdural hematoma admittedly post-traumatic which may or may not have existed several weeks or months with little or no symptoms. He makes a careful distinction between any of these forms and spontaneous endogenous hemorrhage or so called pachymeningitis hemorrhagica, due to a diathesis with typical and marked histological changes in the arachnoid membrane and dura such as thickening, brown discoloration and chronic inflammatory changes. The post-traumatic lesions offer a good prognosis; surgery is the one choice of therapy and it is singularly successful. The hemorrhage of pachymeningitis is essentially beyond the reach of surgery.

JOHN MARTIN, M.D.

Dandy W. E. The Treatment of Internal Carotid Aneurysms Within the Cavernous Sinus and the Cranial Chamber. *Ann Surg* 1939 109 689.

The surgical attack upon intracranial aneurysms is just beginning. In the past few years a few cases have undoubtedly been cured by surgical procedures. These procedures have been (1) direct and (2) indirect, the latter being done by means of inducing thrombosis. In the 3 cases treated in this report the aneurysms were trapped between ligatures.

The 3 aneurysms reported all arose in the intracavernous portion of the carotid artery or just where it enters the cranial cavity and all projected into the cranial cavity alongside the carotid artery and in each case it is believed that the aneurysm was cured. The aneurysms were trapped by (1) intracranial occlusion made with a silver clip, and (2) ligature in the neck.

The intensive cultivation of any field usually discloses the lesion to be of far greater frequency than we have been wont to believe. The diagnosis may be made with the greatest of ease or with great difficulty. Similarly the localization may be easy or difficult. Arteriography, as introduced by Moniz,

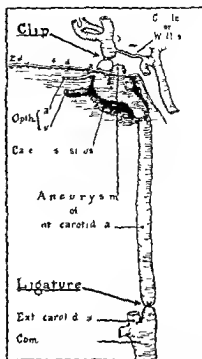


Fig 1. Diagrammatic representation indicating the position of the aneurysm and the method of surgical attack upon it by trapping the aneurysm between the carotid intracranially and the ligature of the internal carotid artery in the neck. (Courtesy of J. B. Lippincott Co.)

frequently permits diagnosis and localization with precision when the signs and symptoms fail completely or are at least uncertain. They may be divided into two groups: (1) those within the substance of the brain and (2) those on the surface of the base of the brain. The latter are known or suspected from five disturbances: (1) recurring sudden severe pain and headache behind an eye; (2) subarachnoid hemorrhage; (3) palsies of the nerves of the extraocular muscles, particularly the third; (4) involvement of the trigeminal and sympathetic nerves; and (5) unilateral loss of vision with primary optic atrophy. Such a syndrome is almost pathognomonic of an aneurysm of the internal carotid artery or of the posterior communicating artery.

Röntgenography may be of considerable aid in the diagnosis of the condition, particularly when erosion of the landmarks of the skull has occurred. Arteriography, as mentioned above, has given some beautiful pictures of this condition and promises great help in the diagnosis and localization. And yet one wonders whether the absence of an aneurysmal shadow can be accepted as positive evidence that an aneurysm does not exist, i.e. whether one is justified in excluding an aneurysm on negative evidence.

At the present time the author is reluctant to employ this measure because of the possibility of cerebral damage but states that with further experience he may well come to its use. There are however definite hazards connected with its use which must be weighed very carefully.

The treatment of these aneurysms is surgical. There is no reason for believing that those of the anterior cerebral artery or even the anterior communicating artery should be attended with more risk than one of the carotid artery but it would be much more difficult to expose those of the posterior communicating or posterior cerebral or basilar arteries sufficiently to clip the trunk on both sides of the aneurysm. However the clipping of one side of the arterial trunk might be adequate. The author prefers exposure of the lesion intracranially for several reasons: (1) the aneurysm can be exposed and the sac ligated possibly without sacrifice of the internal carotid artery; (2) the diagnosis can be visually confirmed; (3) the condition of the cerebral circulation can be ascertained; and (4) the exact localization of the lesion can be determined. These factors may alter the type of attack to be carried out. The 3 cases reported were explored intracranially and the internal carotid artery was ligated with a clip. The internal carotid artery was later exposed through the neck and ligated. Among the conditions which must be present is an adequate cerebral circulation.

All patients especially those more than forty years of age must be subjected to uninterrupted digital carotid compression for ten minutes. It does not insure against eventual trouble but when positive it picks out individuals in whom ligation of the carotid artery would certainly be followed by hemiplegia and possibly death. If the test is positive the only safe procedure would be a partial occlusion of the carotid artery in the neck first preferably with a band of fascia lata. Finally, if evidence of the patency of the aneurysm remains the intracranial exposure and attack can be carried out without the risk of inadequate cerebral blood supply.

JOHN WITTSIEFF EYON, M.D.

Witchell I. S. Abscess of the Brain Following Tonsillitis and Retropharyngeal Abscess. Report of a Case and Review of the Literature. *Arch Otolaryngol* 1939 29 835

The author states that localized thrombosis, abscess or general sepsis follows acute tonsillitis with sufficient frequency to be given first consideration when resolution of an acute tonsillar infection does not take place normally.

When an abscess is formed its cavity entered and pus is found and evacuated prompt subsidence of the infection is expected. In the case reported there was no improvement. Several days of septic temperature followed the incision of the abscess. The possibility of venous thrombosis or dissecting abscesses of the neck was considered. The exploration of the left side of the neck and the left internal jugu-

lar vein failed to reveal any extension of the infection. Blood cultures taken with the temperature at various levels were persistently negative. Although the possibility of meningitis was considered it was not until the twenty second day of the illness when aphasia developed that abscess of the brain was considered.

JAMES C. BRASWELL, M.D.

King J. E. J. Extradural Diploic and Intradural Epidermoid Tumors (Cholesteatoma). *Ann Surg* 1939 109 649

The author has successfully operated on 6 of these rare tumors. Until about 1920 they were not diagnosed before death; altogether only 142 were reported in 1936. The term epidermoid is preferred to cholesteatoma which may be confused with chronic inflammatory lesions about the temporal bone. There are two main sites for these epidermoid tumors which the terms extradural diploic and intradural describe. Very rarely a pinal epidermoid is found. In 3 cases the nature of the lesion was specified before operation and in each case it was an epidermoid of the extradural diploic type. In 1 spinal and 1 intradural type of lesion it was suspected though not actually diagnosed. The extradural diploic epidermoids produce a characteristic scalloped dense clear cut margin. The inner table is more involved than the outer and the defect has a dense edge. The tumors grow very slowly and in 1 case an intradural epidermoid was mistaken for a meningioma because of the length of the history. The tumors are well encapsulated and when the capsule is torn or cut there may be a beautiful white mother of pearl appearance to the tumor mass. The tumor mass may also be homogeneous caseous crumbling structure. In all 8 cases histones are reported in detail with excellent radiographic and other illustrations.

As far as the surgical removal of these tumors is concerned a great deal depends on their position. The intradural variety is often adherent to the deeper structure which makes complete removal of the capsule impossible. This is well illustrated in the author's case of intradural tumor in which the petrous tip and the anterior part of the left middle fossa were affected. The extradural diploic variety on the other hand should be completely removed with the capsule intact.

ADRIEN VERBRUGHEN, M.D.

## PERIPHERAL NERVES

Aird R. B. and Naffziger H. C. Regeneration of Nerves after Anastomosis of Small Proximal Nerves to Larger Peripheral Nerves. An Experimental Study Concerned with Relief of Peripheral Neurogenic Paresis. *Arch Surg* 1939 38 906

Using dogs in well controlled experiments the authors undertook studies on the regenerating capabilities of the sciatic nerve after both immediate and delayed suture. They raised several questions rela-

tive to the eventual functional result (1) Do a fewer number the same number or a greater number of nerve fibers regenerate after simple section and immediate anastomosis of a whole nerve trunk? (2) Does an increased number of regenerating nerve fibers necessarily imply an increased final innervation and function of the muscles supplied? (3) What is the effect on regeneration of delayed suture a situation simulating the conditions of old peripheral neurogenic muscular pareses? and (4) Can good functional re-innervation be obtained in one group of muscles by the use of nerves supplying antagonistic muscles?

Their results led them to believe that the occurrence of a luxuriant regeneration of nerves does not bear a direct relation to re-innervation of the muscles and the final return of muscular function and even though the resulting degree of muscular function may be less than expected after a large regrowth of nerve fibers it seems possible to obtain very satisfactory recovery in the pareses of peripheral origin by the anastomosis of small proximal nerves to larger peripheral nerves as for instance in carefully selected cases of isolated paresis in poliomyelitis. Synergistic muscle groups may be successfully re-innervated by the anastomosis of a nerve supplying one of those muscles to the peripheral portions of the nerves innervating both groups of the synergistic muscles. The flexor muscles of the leg showed a better functional result than the extensor muscles even though the common peroneal was the nerve selected for anastomosis. JOHN MARTIN M.D.

### SYMPATHETIC NERVES

Danielopolu D. The Present Status of the Operative Treatment of Angina Pectoris (Der gegenwärtige Stand der operativen Behandlung der Angina pectoris) *Deutsche medizinische Wochenschrift* 1938 2 1604

The object of treatment of angina pectoris is not the elimination of pain but the avoidance of the onset of an attack. The pain is but a warning signal. The author's method is that of elimination of the pressor reflexes. Toxic fatigue products stimulate the sensory nerve fibers and this stimulus releases the reflex by way of the medulla and spinal cord the rise in blood pressure causes a contraction of the coronary vessels. One must therefore section as many as possible of the most important centripetal nerve fibers but must spare the vagus trunk for respiration and the stellate ganglion for cardiac function. The stellate ganglion contains besides centripetal fibers also sympathetic fibers to the heart musculature and in addition dilator fibers to the coronary arteries. Stellectomy is dangerous since the already diseased heart suffers a severe damage to its function or even complete stoppage.

The author presents as proof of this statement a number of cases operated upon elsewhere, in which the patients died soon after the operation. Also, in the most favorable cases in which the heart was in essentially good condition, stellectomy was not survived for long.

He presents cases of others especially criticizing Jonnescu, who operated upon some hundred cases of various sorts. Basedow's disease, glaucoma, epilepsy, and angina pectoris. Almost none of the latter's patients are living. The alcoholic injection of the superior rami communicantes (Plethnew and White) is physiologically comparable to stellectomy and practical experience seems to support this statement since sympathetic fibers to the heart and sympathetic fibers to the coronary arteries pass through these rami.

The author's operation consists of bilateral cervical sympathectomy with avoidance of the stellate ganglion. Bilateral section of the communicating rami from C6 to Th1 of the vertebral nerve and of the vertically arranged communications of the vagus which run through the thoracic cavity. Those from Th2 to Th4 must be spared since through them run fibers which reflexly maintain the tonus of the dilator nerves to the coronary arteries. Thereby any untoward result would be avoided and not only pain but also the occurrence of an attack would be prevented. The last is important as the author demonstrates by 3 cases of White that while people may no longer perceive pain in an attack nevertheless they can die in one. Up to 1931 in 42 cases of stellectomy there was an incidence of 14 deaths due to heart impairment while in 51 cases treated by his method only 1 early death due to the heart occurred. This death occurred in a patient with a cardiac insufficiency.

However the author does not deny that the next best results after those obtained from his operation can be obtained by stellectomy. There are also some centripetal fibers cut by that method but on the other hand the dilator fibers to the coronary arteries are sacrificed and exactly there lies a potential danger. The efficacy of his method is one third greater than that of stellectomy.

The author also claims that even the patients who are benefited by medical treatment should be operated upon. The possibility of sudden death is never easily foreseen. He operates under a general anesthesia because of the danger otherwise of operative shock. He operates in two stages. In the first he sections the rami communicantes from C8 to Th2 the vertebral nerves and the branches from the vagus and sympathetic trunks. Only when there is some improvement from this much of the procedure does he do the second stage a cervical sympathectomy. (FRANZ) JOHN MARTIN M.D.

# SURGERY OF THE THORAX

## CHEST WALL AND BREAST

Mingazzini I. The Etiology and Clinical Significance of Loss of Blood from the Nipple (Sulla etiologia e sul valore clinico dello scolo di sangue dal capezzolo della mammella) *Arch Ital di chir* 1939 53 163

Mingazzini describes 8 cases of bleeding nipple encountered during the past five years at the Clinic of the University of Milan among 400 women treated for disease of the breast mostly tumors. In this series therefore bleeding nipple occurred in 2 per cent of the cases of mammary disease. The age of the patients ranged from thirty to fifty one year the average being forty one years which is markedly lower than that for malignant tumors of the breast. This relatively early age is important in the etiopathogenesis of the symptom which may be caused by particular conditions of the breast during its period of full glandular activity it raises the suspicion of a functional disturbance while a later age would point to malignant tumor. This is fully confirmed by the reported cases of which 2 in patients aged fifty and fifty-one years respectively prevented a frankly malignant tumor and 1 in a patient aged forty seven years showed incipient malignant evolution. Seven of the patients were married and had 2 or more children which they had nursed with only 1 exception. In 1 woman the bleeding began after she had nursed her child for four and one half months and continued after nursing was stopped. One woman was in the menopause the bleeding had started three months previously and histological examination of the tumor revealed the evolution of a fibrocystic mastopathy into a scirrhous atypical epithelioma. No patient showed any relationship between the menstrual cycle and bleeding from the nipple. One patient traced the origin of her tumor to traumatism which was followed by bleeding nipple more than a year later.

Histological examination demonstrated the great preponderance of the fibrocystic and adenomatous dendritic forms of tumor (7 cases). The fibrocystic and hyperplastic lesions never invaded the entire glandular parenchyma but remained limited to more or less extensive parts mostly in the vicinity of the nipple. The transition from the healthy to the diseased tissue was gradual the fatty tissue between the lobules disappearing and being replaced by fibrous connective tissue in which were found acini and alveoli of varying size lined with epithelium similar to or lower than that of the milk ducts or more often having various forms and resembling the cells which line the lower part of the axillary sweat glands or of the glands opening in the areola close to the milk ducts. These cells are also found after the menopause in senile breasts. Often

the epithelium formed buds in the enlarged and deformed tubules or villous formations and the numerous papillae were ramified to the point of presenting a characteristic dendritic aspect. The vascular network was well developed well filled with blood and often surrounded by zones of infiltration of chronic or subacute inflammatory type. Tubes and cysts were often plugged with blood elements and the connective tissue presented hemorrhagic infiltrations.

Bleeding nipple was the first sign of disease in 5 of the patients in 1 it preceded the appearance of the tumor by ten years and in another by six years. In 3 patients the tumor preceded the bleeding and in 2 of these patients the tumor was histologically malignant. In 2 patients the bleeding was preceded by a sensation of weight in the breast and by pain irradiating to the shoulder. Bleeding nipple is consequently an evident sign of alterations which may have various local or general causes. However the most frequent cause is a benign or a malignant tumor. When bleeding nipple forms part of the symptoms which denote a malignant tumor its importance is secondary for the treatment to be followed. If it is present in benign and clinically uncertain forms of tumor its evaluation is difficult but it would seem advisable to use radical surgical treatment of the tumor. RICHARD KEMEL M.D.

Borghetti U. and De Gasperi A. Factors Predisposing to Breast Tumors (Fattori predisponenti ai tumori mammari) *Tumori* 1939 25 1

In order to discover the possible predisposing factors of breast tumors Borghetti and De Gasperi have made a clinical and statistical study of 809 cases of disease of the breast in women including 651 carcinomas 1 sarcoma 45 fibrocystic mastopathies 107 benign tumors and 4 cases of Paget's disease and of 6 cases of tumor of the breast in men observed during the first decade of work at the Victor Emmanuel III National Tumor Institute of Milan.

The data collected on the heredity of breast tumors can appear only as very uncertain in view of the impossibility of following these factors through many generations as has been done in experimental work. However a hereditary tendency is found throughout the cases of fibrocystic mastopathy which is a precancerous lesion based on a disturbance in the endocrine system. This agrees with the observations of other authors who have shown that the hereditary factor applies more to precancerous lesions than to cancer itself.

The data concerning age lead to the conclusion that it is an important factor in the appearance of cancer of the breast as the frequency of the disease increases gradually with increasing age.

The data collected on the sexual life of the patients reveal the greater frequency of ovarian dysfunction



in cases of fibrocystic mastopathy and, to a lesser degree in cases of benign tumor while on the other hand normal conditions of menstruation and menopause prevail in cases of malignant tumor. Little importance can be attached to the limited period of the menopause during which there appears to be a greater frequency of breast cancer as increasing age already accounts for this fact.

The data collected on the civilian status of the patients show that at the more advanced age which corresponds to the greater frequency of cancer the affected women are those who have led a less active sexual life such as unmarried nulliparous and pauciparous women with a reduced number of nursings at a younger age the most important factor seems to be a succession of pregnancies coming too close together with resulting exaggerated use of the breast. Pre-existing changes in the breast such as sequelae of acute mastitis and rhagades are unimportant, while the presence of benign tumor or of fibrocystic nodules has some significance. Trauma was found in only a low percentage of the cases and cannot be considered as having any importance.

RICHARD KEMEL, M.D.

Dieulaufé R. and Grimaud M. Swollen Arm as a Sequel of Treatment of Cancer of the Breast (Les gros bras consécutifs au traitement du cancer du sein). *Rev. de chir. Par.* 1939 58:161.

The exact conditions which result in the edema of the arm so frequently developing after surgical treatment of cancer of the breast have been difficult to define but the incidence of this complication seems to have increased since attempts have been made to improve the chances of lasting cure by more and more extensive excisions and by the combined treatment of surgery and roentgenotherapy. The degree of this edema varies but amounts in some cases to a veritable elephantiasis. The present discussion deals with severe edema rather than the type following amputation of the breast for cancer.

These severe edemas may be extremely painful and deprive the patient of the use of her arm and are moreover very resistant to treatment of any kind. Etiologically one has to consider two groups of causes. The first is resection of the majority of the lymphatics or veins or both which leads to a transitory edema that may persist if the lymphatic or venous circulation is not restored because the region is itself unfavorable because the muscular resection has been too extensive or because roentgenotherapy has led to sclerosis of the connective tissue. The second is postoperative developments which are associated with inflammation or cancerous recurrence and lead to extensive obliterating lymphangitis compressions by sclerosis adenopathies tumor masses or phlebitis. These causes are not so effective because of the stasis which they produce as because of the vasomotor irritation dependent upon them.

There are four causative types of this edema: the neoplastic, the phlebotic, the infectious and a type without evident cause.

The authors have studied edema in 65 cases as regards site, local temperature and color, as well as the course and time of onset. Oscillometric studies of the limbs, studies of the tissue hydrophilia (by the Aldrich McClure test), and a roentgenological study of the skeleton were made. It was discovered that edema of the arm may develop following any treatment for cancer of the breast. The incidence is directly influenced by the therapeutic combinations and the extent of exeresis. Edemas which cannot be explained on the basis of recurrence, phlebitis or local infection are particularly frequent after extensive operation *per se* or operation combined with roentgenotherapy.

Brachial edema may occur in cancer of the breast in the absence of any treatment. The neoplastic type of edema is common and is characterized by a free interval of variable duration; however this interval is always definitely between the treatment or treatments and the appearance of the edema. The edema increases progressively and leads to enormous elephantiasis of the limb. Local signs indicate recurrence. There is a syndrome of supraclavicular recurrence in which edema and involvement of the brachial plexus may be present together or singly. In this neoplastic type there are often vasomotor disturbances and in particular a marked instability of the arterial blood pressure. The Aldrich McClure test can as a rule not be performed because of the tension of the tissues.

The phlebotic type of brachial edema occurs following the Halsted operation. The authors have seen 10 cases of phlebotic origin. Clinically the phlebotic edemas may be of two types: (a) early which may be white and depressible or blue and tense and (b) late which is chronic, hard and organized with little chance of cure. The latter is accompanied by a whole series of neurosympathetic symptoms such as atrophy of the skin, disturbed perspiration and disorders of peripheral heat regulation. The arterial pressure is not much affected. Occasionally there is a slight diminution of oscillometric amplitude. The Aldrich McClure test is usually but not constantly positive.

In cases in which neither phlebitis nor recurrence can be demonstrated a search should be made for infection. This type develops often in cases in which the wound was left open because suture was impossible but even more frequently in cases of sutured wounds (8 cases). It develops very early and is accompanied by unmistakable signs of inflammation, such as erysipelas and suppurating subclavicular hematoma. This type of edema is depressible at first but may persist after the infection has subsided and the wound has healed. It then develops into the chronic organized type of edema like that seen in the streptococcal edema of the lower limbs. Not only inflammation but lymphatic stasis plays a large part in the etiology of this type of edema. The Aldrich McClure test shows no change or acceleration. The arterial pressure is usually increased with diminution of the oscillometric index.

The edemas without demonstrable cause are usually not very important and may retrogress or disappear spontaneously. They vary in color and consistency and they may be associated with neurosympathetic symptoms. In brief their symptoms indicate their complex nature. Treatment is discussed from a causative, pathogenic and symptomatic point of view. The limb may be placed in suspension right after operation with early and prolonged active mobilization. Mild frequent massage is applied and an Eschmarch band used to compress the limb from time to time. Albert compresses the axillary or subclavicular artery for a few minutes with a finger with resulting vasomotor reflexes leading to a diminution of edema. The various surgical procedures are designed to increase the return circulation and include aponeurotic resection with or without resection of the skin and subcutaneous tissue according to the techniques of Favre, Kondoleon and Sistrunk. Lymphangioplastic intervention has been used in an attempt to create artificial return channels as described by Handley or Walther. All these methods afford only temporary relief and merely postpone the time when amputation of the arm becomes imperative. Prevention is the best method. This may be accomplished by leaving a muscular flap *in situ* to act as a protecting cushion for the neurovascular bundle. Forced suture of the skin is also a factor. Flapstitched substituted dermo-epidermic grafts which prevented the creation of a dead space favorable to infection. The present writers have the impression that the more radical amputation of the breast is more likely to be followed by edema of the arm than the classic Halsted operation.

EDITH SCHANCHIE MOORE

### TRACHEA LUNGS AND PLEURA

Curtillet E. Arterial Gas Embolism (L'embolie gazeuse artérielle). *J de chir* 1939 53 461

This article is based on 3 cases of arterial air embolism complicating operations on the lungs. In spite of the voluminous literature which has appeared on the subject many points in the pathological physiology of air embolism have not even been touched upon. Convinced that some of these problems could be solved only by direct microscopic study in the living animal, the author undertook such a study in the frog and later in the rabbit with the result that certain new facts were discovered. The terms arterial gas embolism and crossed embolism are defined and a short history of the subject is presented.

In his experiments the author studied the penetration of the air into the pulmonary veins its progress through the large and small arteries and the arrest of the air bubble in the arterioles where it caused the embolism. He also studied the level of arrest, the local evolution of the arrested gas, the re-establishment of the circulation, the passage of the air through the capillary barrier, the part played by the physical condition of the air admitted to the circulation, the reactions of the blood and vessels

the amount of air leading to a fatal termination and the cause of death. Finally a chapter is devoted to the study of crossed embolism.

It is necessary to study separately the course of the embolus through the large arteries in which it is subjected to gravity factors as well as to the action of the blood current and its course through the small arteries in which it fills the entire lumen of the vessel. The microscopic study of the course of the air bubble showed that the air never reaches vessels of a caliber of less than  $30\mu$ ; in other words it never enters the capillaries. Arrested in the arterioles of from  $30$  to  $40\mu$  in diameter it is rapidly resorbed. The passage of air from the arteries into the veins may take place as demonstrated by arteriovenous anastomoses of a caliber of more than  $30\mu$  and it is thus comprehensible that such a passage is possible only in regions rich in these canals such as the limbs and face except perhaps in case of the kidney such passage is not possible in the visceral regions as they do not possess arteriovenous anastomoses of sufficient caliber. There can be no doubt that the abnormal existence in the lung of arteriovenous anastomoses of more than  $30\mu$  in diameter of whatever histological type permits the development of crossed embolisms in spite of the absence of interauricular communications.

The microscope likewise permits a demonstration of the mode of restoration of the circulation during the progression and resorption of the air bubble as well as the nature of the local blood and vessel reactions to the embolism.

The quantity of air leading to a fatal termination was found to be from  $0.5$  to  $3.3$  c.c. per kgm. of animal weight. The causes of cerebral and cardiac death in arterial embolism were studied on the basis of the findings of Allen, Hrdina and Clark.

From the clinical point of view the author emphasizes the importance of blindness and the development of symptoms corresponding very well with his microscopic findings. Therapeutically he suggests the possible preventive value of an inclined position and the probable curative effect of acetylcholine, the vasodilating effect of which would favor progression of the air and the liberation of certain vascular regions.

EDITH SCHANCHIE MOORE

Jones J C and Dolley F S. Lobectomy and Pneumonectomy in Pulmonary Tuberculosis. *J Thoracic Surg* 1939 8 351

Certain cases of tuberculosis are cured only by a partial or total surgical removal of the diseased lung. These authors believe that pulmonary lobectomy and pneumonectomy should be used in the modern program of surgical collapse therapy. They admit that this treatment still remains definitely a debatable subject and report 4 cases in detail and give opinions as to indications for this type of treatment.

The authors state that it is impossible to accomplish complete removal of the tuberculosis of the lungs by lobectomy and pneumonectomy. They think, however, that there is a place for such opera-

tions and give their opinion as to the indications. When the partial or complete removal of a tuberculous lung offers the patient his only chance of cure, and when the patient's general condition apparently is suitable for major surgery a fair indication is present.

In patients having frequent large hemorrhages which are not controlled by collapse with pneumothorax and phrenicectomy, a lobectomy is a far safer procedure than thoracoplasty.

A suppurating lung is not cured by thoracoplasty but is often made worse because of disturbance of the bronchial drainage. Here a lobectomy or pneumonectomy is certainly the procedure of choice.

When tuberculous cavities are present and have failed to close after extensive thoracoplasty a lobectomy for the residual cavity should be given due consideration.

Another type of lesion that should be treated by lobectomy is an atelectatic firmly contracted honeycombed lobe with persistent positive sputum after thoracoplasty has been completed.

There is also the rare unilateral basilar tuberculous cavity which does not heal after the usual procedures of collapse therapy have been employed. Lobectomy should be considered in all such cases if the patients are good or fair risks for major surgery.

The authors state that for years surgeons have been laboring under the false premise that a tuberculous lung should not be touched.

While this is true in the great majority of cases they believe we should bear in mind the occasional exceptions to the rule and be not too dogmatic in our beliefs.

J DANIEL WILLEMS M D

**Benedict E B** Bronchoscopic Dilatation of Bronchial Stenosis Following Thoracoplasty for Tuberculosis. *New England J Med*, 1939 220 617

This author recognizes the probability of some degree of tuberculous tracheobronchitis before thoracoplasty in a great many tuberculous lungs, and further that the collapse of the lung, with the possible kinking and compression of the bronchi results in an approximation of the bronchial surfaces and local spread of the tuberculous process, with ulceration and stenosis.

He reports 3 cases of bronchial stenosis following thoracoplasty for tuberculosis in detail. Marked benefit was noted in all these cases after bronchoscopic dilatation. In no case did the bronchoscopy reactivate the tuberculosis.

J DANIEL WILLEMS M D

**Edwards A T** Modern Principles of Treatment in Bronchiectasis Based on 199 Cases Treated by Lobectomy or Total Pneumonectomy. *Brit M J* 1939 1 809

Although bronchiectasis is now considered to be a progressive disease sufficient evidence to provide undoubted proof of this is lacking. By investigation it may be possible to prove that certain types of

bronchiectasis are progressive whereas other types may remain stationary for long periods, or even retrogress. It is definitely recognized that in bronchiectasis following prolonged retention of a foreign body which has subsequently been coughed up or removed or following the obstruction caused by a benign tumor which after removal has left no narrowing of the bronchial lumen the disease often becomes progressively worse. Such proof as is obtainable points to the fact that bronchiectasis in children and adults is a progressive disease which in a large proportion of cases ends fatally.

The medical care of bronchiectasis until quite recently consisted of the use of expectorants the administration of creosote by mouth, and the treatment of complications such as recurrent attacks of pneumonia and hemorrhage, by bed rest and careful nursing. More recently, however considerable benefit has been derived from postural drainage. Many patients with widespread bronchiectasis can be kept relatively comfortable and may lose the fetor often associated with the disease by postural drainage for one half hour mornings and evenings.

Lately, sporadic attempts at the surgical treatment of bronchiectasis have been made. The use of artificial pneumothorax has been advocated but when bronchograms are made even when the lung is well collapsed the dilations are still visible and often unaffected in size or shape. Artificial pneumothorax therefore must be considered unsatisfactory in established bronchiectasis.

The object of phrenicectomy and thoracoplasty is to keep the cavities empty and to prevent the retention of secretion by compression of the lung. In some cases, paralysis of the diaphragm results in improvement, probably as a result of the alteration in the direction of the basal bronchi from a vertical to a horizontal position by the rise in the diaphragm. Thoracoplasty has resulted in great improvement in many cases of unilateral bronchiectasis but if the disease is localized the pulmonary collapse produced by the operation often occurs at the expense of the relatively normal tissue.

Excepting the risks of the operation itself all the complications of lobectomy occur as the result of sepsis. They include suppurative pneumonitis, secondary hemorrhage, cerebral abscess, and suppurative pericarditis. Any procedure which permits the safe creation of firm adhesions between the unaffected portion of lung and chest wall will greatly serve to reduce the mortality of lobectomy by the double benefit of a minimum of pleural cavity to be infected and a minimal amount of respiratory disturbance during and after the operation. The prevention of extensive pleural infection is most important in lobectomy.

A satisfactory way to obtain adhesions is to blow B P C talc powder (magnesium silicate to which 0.5 per cent iodine has been added) on to the unaffected lobe of the lung which is collapsed by a previous artificial pneumothorax. The air which is introduced into the pleura before operation is im-

mediately withdrawn and the cannula is removed. This procedure (pleural poudrage) is carried out under local anesthesia. Firm adhesions develop within from three to six weeks. There appears to be no deleterious effect on the lung itself.

The indications for lobectomy may be summed up by stating that bronchiectatic patients between the ages of four and forty years in whom the disease is reasonably localized and infected and in whom there is no serious general contraindication should be considered as candidates for radical excision of the portion of lung affected. Lobectomy and pneumonectomy provide the greatest advance in the treatment of bronchiectasis. They are procedures which are associated with a mortality that should be negligible if the disease is treated in its early stages and which have a high proportion of curative results.

SAMUEL KAHN, M.D.

Bohrer J. V. and Lester C. W. Late Results of Lobectomy for Bronchiectasis. *J. Thoracic Surg.* 1939 8 412

These authors report on a series of 10 patients in whom lobectomy was done for bronchiectasis. All of the patients were children. In 1 a single stage pneumonectomy was done in 2 complete pneumonectomies were done in which the upper lobe was removed at the second operation in 1 the right lower and middle lobes were removed and in the remaining patients lobectomy only was done.

In all patients in whom the entire pathological pulmonary tissue was removed a cure resulted. In those patients in whom the lower lobe was removed and in whom there was only slight involvement of the upper lobe the disease progressed and necessitated later removal of the upper lobe. The authors believe that whenever it is feasible a pneumonectomy in stages is indicated. There have not been any postural deformities following these operations. It was not found necessary to do a thoracoplasty following the pneumonectomy but phrenic resection or crushing of the phrenic nerve to obliterate the space caused by the pneumonectomy was essential. No visceral or circulatory disturbances were caused by the elevation of the diaphragm or by the shift of the mediastinum.

The electrocardiogram of all these patients was found to be essentially normal. No cardiopulmonary disturbance was noted even in the case of a child in whom the heart was in a transverse position. The bronchospirometric curves and the oxygen and carbon dioxide content of alveolar air were not determined but clinically there was no disturbance in the pulmonary interchange of gases. The patients were able to undergo violent exercise with a normal amount of fatigue.

Histologically emphysematous dilatation of the remaining lung was found in 1 case at autopsy. When unilateral diseased lungs were operated upon there was no spread to the other lung.

Physical development in these children after operation was normal. The normal angle between the

stem bronchus and the trachea was shown to be increased on the uninvolved side and decreased on the operated side. This caused some difficulty in the passage of a bronchial catheter in the stem bronchus of the uninvolved lung.

The authors have found that medically treated patients do surprisingly well but that endless intelligent methodical attention is required. The mortality of patients not operated upon at least up to the age of twenty years is not great. Recurrent pneumonia and metastatic brain abscess account for most of the deaths. Moderate or even advanced bronchiectasis is not incompatible with fair longevity but social ostracism and mental complexes are very common handicaps.

In conclusion these writers speculate on the future surgery of bronchiectasis and predict that surgical relief will be very much more frequent during childhood for soon the pediatricians will not hesitate to refer these patients to the thoracic surgeon for cure and thereby greatly reduce the incidence of bronchiectasis in adults. Children withstand the operation better than adults.

Surgery is the only cure. It will obviate complications and prevent deformities and therefore will prevent ostracism of the patients.

J. DANIEL WILKINS, M.D.

Churchill E. D. and Belsey R. Segmental Pneumonectomy in Bronchiectasis. *Ann Surg.* 1939 109 481

Greater precision in diagnosis and operative technique now indicate that the bronchopulmonary segment may replace the lobe as the surgical unit of the lung. Bronchiectasis is frequently limited to one or more bronchopulmonary segments within a lobe the remainder of the lobe being normal. It also tends to be primarily multilobar in its distribution. This characteristic of the disease provides a rational basis for proposing the resection of diseased bronchopulmonary segments from several lobes if necessary with the conservation of normal lung segments rather than the continued removal of entire lobes as unit structures. This principle finds particular application in early cases of bronchiectasis and those with a bilateral distribution.

A recent survey of cases at the Massachusetts General Hospital revealed that the lingula segment of the left upper lobe is involved sufficiently to demand resection in at least 80 per cent of the cases of bronchiectasis of the left lower lobe the most common site of the disease. The disappointing clinical results of some lobectomies can be explained by the failure of workers to appreciate this high incidence and the perpetuation of cough and sputum attributed to residual disease in an unresected lingula. The lingula process of the left upper lobe stands therefore as an anatomical entity of great practical significance.

The anatomy of the lingula process is described and illustrated in detail and the clinical utilization of the lingula bronchus by lipiodol bronchog-

raphy is discussed. The lingula process may be considered as a homologue of the right middle lobe. It occupies a corresponding position but while the fissure between the upper and middle lobes is usually well developed on the right side on the left side this is uncommon.

The operative technique of resection of the lingula is also described.

In the authors series the lingula has been resected with the left lower lobe in 44 cases. It has also been resected without removal of the lower lobe in 1 instance and at a period subsequent to lower lobe lobectomy in 1 instance. There have been no deaths in this series. Bronchial fistulae have closed spontaneously with 1 exception. This complication may or may not be attributable to the lingula resection, or may have been due to the fact that the posteromedial division was removed and bronchiectasis was left in the anterolateral segment.

In conclusion it is suggested that the bronchopulmonary segment may replace the lobe as the surgical unit of the lung. SAMUEL H. KLEIN, M.D.

#### ESOPHAGUS AND MEDIASTINUM

Schuhert W. The Pathogenesis of Esophagitis  
(Zur Pathogenese der Speiseröhrentzündung)  
*Arch f path Anat* 1938 303 158

The inflammatory changes of the esophageal mucosa have been given very little consideration because the picture of esophagitis macroscopically resembles the autopsy appearance of the well known acid esophagomalacia. However histological examinations show that in these cases intravital inflammatory processes are very often responsible. The author has therefore examined 100 esophagi histologically after a careful macroscopic study. In this investigation it was found that only 37 esophagi were free from pathological findings. 50 showed chronic inflammatory infiltrations of the individual mural layers and acute inflammatory changes were found in 13. Consequently esophagitis is not so very rare.

Altogether 34 cases of acute esophagitis were examined. Macroscopic changes could be found only in the lower third of the esophagus and only in 4 cases were such changes present in the other parts. Stripe shaped changes were found in the course of the longitudinal folds as well as flatly shaped extensive foci. They were usually of a dirty brown color or showed a markedly reddened mucosa with whitish deposits. In the histological examination all forms of the inflammation were found: the catarrhal erosive the pseudomembranous and the ulcerated or phlegmonous esophagitis. The patients that showed these individual stages of the inflammation in a developmental series were always markedly emaciated. These inflammations are the same that are found also in the intestinal mucosa without the characteristics of any specific injury, one cannot therefore as Hamperl has done draw specific conclusions as to the cause. Only in a third

of the cases could the author demonstrate any effect of the gastric juice. This effect of the gastric juice is therefore probable but a healthy esophageal mucosa is definitely insensitive to the effect of gastric juice. The simultaneous occurrence of esophagitis and gastro intestinal ulcers was found in only 4 of the 34 cases examined. The injured esophageal mucosa offers the gastric juice and other noxa only slight or no resistance. Among these injuries circulatory disturbances are the most important and in 25 cases they could be definitely demonstrated. Similar changes may also be caused by cachexia or other emaciating diseases. Local circulatory disturbances also lead to such inflammations of the mucosa. In one case it was a submucous hemorrhage in another a thrombus formation in the submucous veins and in a third an arteriohyalinoses. Metabolic disturbances produced by diabetes were the cause of the esophagitis in 3 cases. The condition was therefore produced by the gastric juice the primary factor being the reduction of the resistance power of the esophagus while the gastric juice was one of the various exciting factors.

(SALTZ) LOUIS NEUWELT, M.D.

Hunt W. M. Periesophageal Abscesses. The Importance of Early Surgical Interference. *Ann Otol Rhinol & Laryngol* 1939 48 128

This report is concerned with infection of the mediastinum in the cervical region following a rupture of the esophagus. The causes of rupture of the esophagus are (1) foreign bodies (2) instrumentation and (3) spontaneous rupture accompanying malignancy.

Briefly the diagnosis of a cervical periesophageal infection is suggested by (1) the suspected or observed perforation by a foreign body instrument or malignancy (2) the marked collapse of the patient observed at the time of perforation (3) pain tenderness and swelling over the area (4) the inability to swallow (5) the absence of dyspnea unless a pneumothorax has occurred (6) an increased leucocyte count of from 15,000 to 23,000—usually the higher (7) a sudden rise of temperature though seldom higher than 103° F (8) definite evidence by roentgen examination of a widening of the prevertebral or post tracheal space and (9) emphysema which may be readily ascertained by palpation or observation or which may be recognized only by roentgenological examination. The roentgenogram is the determining factor in diagnosis and is of aid in the differentiation between a simple cellulitis which might disappear and an abscess formation with a bubble of air. Daily roentgenograms should be made following any known perforation.

External incision and drainage may be performed immediately upon the diagnosis of esophageal perforation. Intra esophageal treatment should be used only in the most selected cases. It may be better surgery to deliberately open and pack off any known esophageal rupture before an abscess has developed.

The technique of operation is described and clinical case reports are presented. It would seem from these reports that early surgical drainage of these areas is definitely indicated and that the mortality is low if drainage is thoroughly established while the infection is localized in the region of the perforation. Untreated cases are fatal if a real abscess has developed.

SAMUEL H. KLEIN, M.D.

Bohrer, J. V. Esophagogastrostomy for Carcinoma of the Esophagus. *Iowa Surg.* 1939, 109:555.

Lesions in the region of the esophagus and cardiac portion of the stomach long defied surgical attack because of the need of a transpleural approach because of the absence of a serous coat from the esophagus and because of the menace of postoperative mediastinitis. Advances in technique have partially overcome at least two of these factors.

The author reports the case of a forty-six year old woman who had an obstructing annular squamous cell carcinoma at the lower end of the esophagus. Anemia and weight loss were marked. The stomach was contracted, holding only 4 oz. of fluid.

In preparation for operation a Levine tube was passed through the nose and into the stomach and a high caloric diet was given. Left pneumothorax was induced ten days before operation. Operation was done through a left anterior thoracotomy at

the level of the eighth rib. A short radial incision through the left side of the diaphragm and esophageal hiatus allowed delivery of the gastric cardia into the thorax. The tumor was resected and starting at the greater curvature the stomach was closed down to an aperture just large enough to permit anastomosis with the esophagus. This was done with interrupted silk sutures in two layers with some reinforcement to the adjoining structures. A Levine tube was passed to the stomach and the wound was closed. On the seventh day a small fistula opened alongside of the thoracotomy drainage tube and oral feedings emerged here. Accordingly a jejunostomy was done and all feedings were given through it. This induced hyperperistalsis with almost immediate evacuation. The fistula seemed to be closing; the patient remained afebrile and then suddenly she died on the twenty-seventh postoperative day, presumably of cerebral embolism.

Autopsy showed failure of the mucosa to heal at the site of the anastomosis and communication of the fistula thus formed with the pleural cavity. Small metastases were found in the liver and in the regional lymph nodes. There was also a fibrinopurulent pleurisy on the left side. The author believes that the indwelling Levine tube may well have exerted constant pressure on the suture line and induced partial breakdown. He expresses a definite preference for the thoracic route in the treatment of lesions in this region.

AUGUST JONAS, JR., M.D.

# SURGERY OF THE ABDOMEN

## ABDOMINAL WALL AND PERITONEUM

Tuch A. Spontaneous Rupture of the Abdominal Muscles (Ueber spontane Ruptur der Bauchmuskeln) *Eests arst*, 1938 17 521

Two cases of spontaneous rupture of the abdominal muscles without external violence are reported. The first was a rupture of the left rectus muscle with a fist sized hematoma from a branch of the inferior epigastric artery. It was apparently caused by severe strain during physical labor. Operation was done under the suspicion of volvulus of the sigmoid. The second was a rupture of the right rectus muscle with a plum sized hematoma in the muscle. It was operated upon with the diagnosis of ovarian cyst. There had been a chronic cough. About 150 cases of ruptured abdominal muscles have so far been reported but they probably occur much more frequently.

The rectus muscle is most often involved, the oblique or transversus less frequently. The following large vessels may be torn: the superior and inferior epigastric and the superficial and deep circumflex iliac arteries. The rupture occurs from abdominal pressure due to contraction of the abdominal muscles. Etiologically there may either be extraordinary strain on normal muscles as in sports and tetanus or there may be physiological contractions such as coughing, yawning, vomiting and defecation in the presence of diseased muscles presenting waxy or hyaline degeneration following infectious diseases. Typhus, tetanus, diphtheria, cholera, influenza, trichinosis, syphilis, tuberculosis and abscesses therefore play a rôle in the history. Waxy degeneration however can also occur from chronic lesions causing coughing or constipation. The incidence of rupture in these abdomens in otherwise healthy persons suggests fatty infiltration of the muscle. Rupture during pregnancy is due to diseased musculature in the form of myositis fibrosa.

Herlyn states that a correct diagnosis was made only 7 times in 37 cases. The picture may resemble that of an intra-abdominal process because of pressure of the hematoma upon the peritoneum or because of small tears in the peritoneum. On the other hand there may be absence of pain at the site of the hematoma. It is important that hematomas in the rectus muscle are movable transversely but not vertically and that they do not extend beyond the medial margin of the rectus. They may extend from the symphysis to the rib margin. If deep lying vessels are torn, pain occurs first and the hematoma later.

A hematoma may become absorbed or it may become encapsulated and form a cyst. It may suppurate and lead to extensive scar formation, or even give rise to tumor formation. Also a hernia may de-

velop as a result of fascial and muscle tear. Pressure upon the bowel and hemorrhage therefrom has also been described. The treatment of choice is operation. If the hemorrhage cannot be stopped, the hematoma should be evacuated and drainage instituted. (R. ARMSBY) LEO M. ZIMMERMAN M.D.

Previtera A. The Common Mesentery (Sul mesenterium commune) *Arch ital di chir* 1939 55 331

By common mesentery is meant a disturbance of the dynamic evolution of the median loop so that there is a failure of coalescence of the mesentery with the parietal peritoneum. With increased x ray, surgical and autopsy studies the condition has become better known. After a resume of some of the pertinent literature the author describes the normal process of development and rotation of the bowel. He then discusses the various theories offered to explain the condition and divides the cases into 4 groups.

In Group I he suggests that there may be failure of intestinal rotation where the small intestine remains in front of the colon with the duodenojejunal flexure in the mid line. Here the splenic flexure is lacking and the small intestine, cecum and ascending colon are attached by a common mesentery to the posterior abdominal wall.

In Group II with incomplete rotation, the small intestine is situated to the right and the colon to the left of the mid line.

In Group III there is an inverted rotation of the umbilical loop.

Group IV includes cases in which there is a perverted rotation of the median loop of bowel.

The author concludes that the common mesentery depends most often on disturbed rotation of the umbilical loop of bowel.

The most common symptoms are of a mechanical nature as characterized by volvulus, torsion and invagination. Surgical treatment aims at restoration of normal conditions to the intestinal attachments according to the findings in the individual case. The author reports 2 such cases in detail with x ray findings. An extensive bibliography on the subject is included. (JACOB E. KLEIN M.D.)

Benedetti Valentini F. Acute Torsion of the Omentum Free in the Peritoneal Cavity (Torsione acuta dell'omento libero nella cavità peritoneale) *Policlin* Rome 1939 46 sez. chir. 133

The author reports the case of a man aged forty-one years who nine years previously had been operated upon for right inguinal hernia which recurred after eight months and who was now admitted with the diagnosis of acute appendicitis and diffuse peritonitis. Operation revealed the presence of a large quantity of strongly hemorrhagic fluid in the peritoneal cavity and of an omental mass slightly adherent to the cecum, the neighboring

The technique of operation is described and clinical case reports are presented. It would seem from these reports that early surgical drainage of these areas is definitely indicated and that the mortality is low if drainage is thoroughly established while the infection is localized in the region of the perforation. Untreated cases are fatal if a real abscess has developed.

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ALGER JONES, JR., M.D.



and man. The time necessary for the production of complete necrosis of the appendix appears to be somewhat shorter in man than in the experimental animal. The discrepancy however may be due to the difficulty of establishing the exact time of onset of the pathological involvement.

From an anatomicopathological standpoint there are 2 obvious points of similarity between segmental appendicitis in the rabbit and the same condition in man: (1) the vascular supply in both is of the terminal type, and (2) the clearly defined segmental lesions produced by vascular ligation in the rabbit resemble both grossly and microscopically, those observed in man.

Whether the blood vessels are affected by systemic toxins or by bacteria from a distant focus or whether they are obstructed secondarily by distention of the lumen by angulation or by foreign bodies, the theory of vascular occlusion as the cause of segmental appendicitis seems plausible. The applicability of this theory to the pathogenesis of appendicitis in general is also suggested.

SAMUEL KAHN, M.D.

**Sylvestre C. Inflammatory Tumor from Non-Resorbing Ligature of the Appendiceal Stump**  
(Tumor inflamatorio por ligadura no reabsorbible del muñón apendicular). *Del Soc. de ciruj. de*  
*1939 No. 1*

Abdominal muscles. Attention came to the author's attention by extraordinary stimulation upon for chronic appendicitis sports and tetanus or was complained of abdominal contractions, such as coughing, hiccup, and fever of defecation in the presence of disease. The right presenting waxy or hyaline degeneration follows the infectious diseases. Typhus, tetanus, diphtheria, cholera, influenza, trichinosis, syphilis, tuberculosis, and abscesses therefore play a rôle in the history. Waxy degeneration, however, can also occur from chronic lesions causing coughing or constipation. The incidence of rupture in obese abdomens in otherwise healthy persons suggests fatty infiltration of the muscle. Rupture during pregnancy is due to diseased musculature in the form of myositis fibrosa.

Herlyn states that a correct diagnosis was made only 7 times in 37 cases. The picture may resemble that of an intra-abdominal process because of pressure of the hematoma upon the peritoneum or because of small tears in the peritoneum. On the other hand, there may be absence of pain at the site of the hematoma. It is important that hematomas in the rectus muscle are movable transversely but not vertically, and that they do not extend beyond the medial margin of the rectus. They may extend from the symphysis to the rib margin. If deep lying vessels are torn, pain occurs first, and the hematoma later.

A hematoma may become absorbed or it may become encapsulated and form a cyst. It may suppurate and lead to extensive scar formation or even give rise to tumor formation. Also, a hernia may de-

velop point of reflection and to free the rectum from the hollow of the sacrum down to the tip of the coccyx. Normally, the posterior walls of the lower part of the sigmoid and of the rectum are only loosely attached to the hollow of the sacrum by areolar tissue. This portion of the bowel then can be pulled up out of the hollow of the sacrum and in many instances the lower part of the sigmoid and the recto-sigmoid can be completely exteriorized as in a Mikulicz type of operation. This procedure leaves a cavity between the hollow of the sacrum and the rectum, and it was our observation that in many of these cases this cavity filled in with a ridge of scar tissue which produced firm fixation of this portion of the bowel. It was reasoned that if the pelvic colon could be pulled up until the rectum was taut and held in this position, at least temporarily, by sigmoidopexy, the rectum would become fixed in this taut position by the formation of scar tissue in the hollow of the sacrum and complete rectal prolapse thereby could be cured.

The technique of this operation for rectal prolapse is as follows:

The patient is hospitalized for two or three days of pre-operative preparation during which time the bowel is emptied by the administration of saline purgatives, colonic irrigations, and use of a diet of which the residue is less than that of a regular diet but more than that of a non-residue diet.

The operation usually is performed under spinal anesthesia. The patient is placed in the high Trendelenburg position and the abdomen is opened through a left paramedian incision which extends from the symphysis pubis to a level just above that of the umbilicus. A Balfour self-retaining retractor is inserted, the small bowel and upper part of the

The arteries are separated from the pelvis by a moist depends moist and if the patient is female the uterus, bifurcal loop of the anteriorly.

The most common which frequently is found rather nature as character is mobile than usual is gently vagination. Surgical treatment and an incision is made in the of normal conditions to the of the mesentery of the according to the findings in the ward the bladder. The author reports 1 such case in detail for a very great dis- ings. An extensive bibliography is able to identify the included. JACOBI of the pelvis. Care inferior mesenteric of these branches.

**Benedetti Valentini F. Acute Omentum Free in the Peritoneum**  
(Sione acuta dell'omento libero toneale). *Policlin. Rome* 1939

The author reports the case of a one year old child who nine years previously operated upon for right inguinal hernia. It occurred after eight months and was admitted with the diagnosis of acute diffuse peritonitis. Operation revealed a large quantity of strongly inflamed peritoneal cavity and of a slightly adherent to the cecum, elevated position treated in various

ways which depend on its length and mobility and whether the patient is male or female. In the main however the bowel is fixed in its elevated position by its suture to various portions of the abdominal wall and to the pelvic organs. Frequently it can be supported by a combining suture of the portions of the mesentery of the two loops of elevated bowel and further by attachment of the bowel to the uterus. In some cases the bowel is sutured to the peritoneum of the lateral walls and to the brim of the pelvis in other cases to the anterior abdominal wall. In every instance care must be taken in placing the sutures onto the wall of the bowel lest leakage of the bowel results. Commonly the colon can be adequately anchored by the suture of fat tags to the rectal tissues and when it is necessary to suture the wall itself the needle should pass through only the peritoneal coat. Care must be taken not to leave an opening through which a portion of small bowel might herniate.

After the operation in order to avoid gaseous tension in the rectum a rubber tube is passed through the anus and is left in place for four or five days. During this period the bowels are kept constipated and a non residue diet is prescribed. Following this period the constipation is relieved by the administration of oil enemas and of mineral oil by mouth. The diet is gradually increased and the stools are kept soft by the frequent administration of oil. The patient should remain in bed for two weeks following the operation and then should be cautioned to avoid strenuous efforts for from three to six months.

During the past two years we have performed this type of operative procedure on 6 adult patients with complete rectal prolapse but we realize that the success or failure of an operation cannot be evaluated until a large group of patients have been studied over a long period. However in view of the many poor results that have been obtained in advanced cases of complete rectal prolapse when other operations have been employed and because of the theoretical soundness of this operation and the excellent immediate results in these 6 cases we were encouraged to present it for consideration.

Stone H B. Megarectum and Megasigmoid. *Ann Surg* 1939 109 791.

The author reports the cases of 2 patients with segmental gigantism of the colon. In 1 the condition was the result of deformities incident to an imperforate anus at birth. It had been opened by a stab wound in the anal position but the opening had never been exactly satisfactory and had required many operations in an attempt to improve it. Having no spontaneous desire for defecation the patient's bowel would frequently fill up with fecal material which he had to wash out laboriously. Between times there was a constant slight seepage of fecal material.

Operation was performed in 2 stages (1) the removal of the tremendous fecal reservoir and pro-

duction of an adequate outlet and (2) the establishment of sphincteric control. The first part was carried out somewhat as the first portion of a Miles abdominoperineal resection for cancer. The sigmoid was freed of peritoneal covering the mobilized bowel was pushed into the pelvis and the pelvic peritoneum closed over it to form a new pelvic floor. The abdomen was then closed the patient placed in the lithotomy position and the scarred anal opening excised through a generous oval incision. The rectal wall was dissected from the surrounding structures until the mobilized area was encountered. The freed gut drawn through the perineal incision was amputated and the edges stitched to the perineal skin. The author states that if he were to do this operation again he would mobilize the bowel but would not construct a new pelvic floor until after the completion of the perineal portion of the operation. It is believed that by avoiding the repair in the early part of the operation the difficulty in crowding down the bulky gut into the pelvis would not arise and a more extensive resection could be done and a more secure pelvic diaphragm would be obtained.

The wound healed with a moderate amount of infection but there was some upward retraction of the mucosa with the result that the anal opening was somewhat funnel shaped. Later an attempt was made to construct an artificial sphincter by the use of fascia lata and bundles of the gluteus maximus muscle. This procedure was only moderately successful.

The second case was that of an old man who had an excessively redundant sigmoid for which no cause could be ascertained. This man had no great symptoms and no surgery was recommended.

JOHN WALTIE ERTOV M D

David V C and Loring M. The Relation of Chronic Inflammation and Especially Lymphogranuloma Inguinale to the Development of Squamous Cell Carcinoma of the Rectum. *Ann Surg* 1939 109 837.

Squamous cell carcinoma of the anus is relatively uncommon and comprises less than 2 per cent of all the cancers of the rectum. The relationship of fistula in ano to the development of squamous cell carcinoma has received some attention in the literature. In a series of over 500 cases of rectal fistula the authors have seen but 1 instance in which a squamous cell carcinoma developed in the chronic inflammatory tissue of the fistula. The authors have examined over 300 cases of lymphogranuloma inguinale with rectal manifestations and believe that there is a definite association between the irritation produced by this latter condition and carcinoma. They report a case which was seen twenty years ago before a specific diagnosis of lymphogranuloma inguinale could be made by the Frei test. The patient was a female aged forty five who had been under their care for several years with a typical progressively developing stricture of the rectum which is characteristic of lymphogranuloma inguinale. Colos-

tomy was advised but refused. She developed a perirectal abscess and draining fistulas. After several years of suffering there developed an induration in the ischiofemoral fossa which broke down. These occurred at the site of the fistulous tract. The lesion was found to be a squamous cell carcinoma.

During 1938 the authors lost 2 patients with squamous cell carcinoma each of whom had advanced lesions of lymphogranuloma inguinale of the rectum. In both of these cases the patient had been under the authors' care for several years and an autopsy in both instances proved the presence of carcinoma.

The authors have been able to find in the literature only 2 cases of lymphogranuloma inguinale of the rectum complicated by the development of squamous cell carcinoma. Another patient who had a lymphogranuloma inguinale developed a squamous cell carcinoma in the vaginal fornix.

ROSSER in the discussion states that they have had a total of 16 cases of malignancy in the anal canal apparently induced by fistulas, hemorrhoids, ulcers or chronic similar lesions. In 9 of these cases the lesion was not a squamous cell cancer but an adenocarcinoma. They have had over 200 cases of lymphogranuloma inguinale involving the rectum, and in none did a squamous cell cancer develop so that he differs with David who states that the sequence is of usual occurrence.

SINGLETON in discussing David's report states that since 1920 they have had at the University of Texas Hospital in Galveston 181 clinically proved cases of lymphogranuloma inguinale with rectal involvement. In the entire group not 1 developed carcinoma. The explanation is that these patients do not live very long and comparatively few reached the age of sixty. In the same period of time they had 47 adenocarcinomas of the rectum and 7 epitheliomas or flat celled carcinomas. None however were preceded by lymphogranuloma inguinale.

ALTON OCHSNER, M.D.

Grinnell R. S. The Grading and Prognosis of Carcinoma of the Colon and Rectum. *Ann Surg* 1939 109 500

A series of 223 cases of carcinoma of the colon and rectum has been studied. Adequate follow-up records were obtained in 205 or 92 per cent. The 4 criteria for histological grading: glandular arrangement, invasiveness, nuclear polarity, and number of mitoses were found to be of value from the follow-up results.

Both a numerical and non numerical method of grading were tried based on the 4 criteria selected. As both gave very similar results the non numerical method was adopted because of greater simplicity. Three grades of malignancy were used instead of the usual four.

Most of the cases were classified as Grade I or II. There were 10 per cent more tumors of Grade I and 16 per cent fewer of Grade III in the colon than in the rectum, this fact suggesting that tumors

of the colon tend to be better differentiated than those of the rectum. Most of the simple "colloid" tumors were of Grade I and nearly all those of the signet ring type were of Grade III.

A definite relationship was found between the follow-up results and the grade of the tumor. The chances of living five years without recurrences were three times as good for the patients with Grade I tumors as for those with Grade III tumors. The same relationship was seen when the patients with and without node metastases were studied separately although it was less striking. The incidence of metastatic lymph nodes increased with the grade of tumor.

The distribution of cases according to Dukes' classification showed a higher proportion of advanced C cases in the rectum than in the colon with a correspondingly smaller proportion of A cases. Only 2 out of 69 cases showed node metastases before the bowel wall had been penetrated. Dukes' generalization in this regard has been shown by this series to apply to the colon as well as to the rectum. Follow-up results according to Dukes' classification showed striking differences between the A, B and C cases. No definitely proved case terminated fatally after operation from recurrence. The chance of five year survival without disease was over four times as good in the A as in the C cases. The value of this classification in prognosis is obvious.

A definite relationship was found between the grade method and Dukes' method of classification. Most of the A cases were found histologically to be of Grade I and very few were of Grade III, whereas C cases were for the most part of Grade III and very rarely of Grade I. The extent of spread of a tumor at operation is of the greatest importance in the prognosis in any particular case but is in turn based primarily on the rate of growth as evidenced by the grade of the tumor. Both criteria should be used in prognosis to supplement each other. A classification combining both the grade and Dukes' method is presented.

Lymph node metastases occurred in 27 per cent of the cases of the whole group and were twice as frequent in the rectum as in the colon. They were present in 30 per cent of the colloid cases occurring in 50 per cent of those of the signet ring type and in 18 per cent of the other colloid cases. The incidence of five year survival was two and one-half times higher when the nodes were not involved than when they were. Tumors classed by gross examination as projecting gave far better five year results than those classed as 'infiltrating'. Most of the projecting tumors were histologically of Grade I and the infiltrating were of Grade III.

Variations in the histological grade in different parts of the same tumor were frequent. The grade of the tumor in the metastatic nodes was usually the same as that found in the main tumor. In 78 per cent of the 76 rectal tumors in which biopsies were taken the biopsy showed the same grade as the tumor. In 22 per cent of the cases, the biopsy was

at least one grade less malignant. In no case was it more malignant.

The presence of enlarged lymph nodes is not a reliable indication of metastases. Of 97 cases in which the nodes were reported enlarged only 38 per cent had metastases. No relationship could be found between the age of the patients and the five year results.

The follow up results which included operative deaths, cases lost to follow up and deaths from other causes showed that 29 per cent of the patients in the combined group, 32 per cent of those with carcinoma of the colon and 25 per cent of those with carcinoma of the rectum had been alive for five years without disease. Of the 17 colloid cases not including the inget ring type, 4 per cent survived five years without evidence of disease as compared to 30 per cent of the inget ring cases. Both series however are too small to warrant conclusions. Thirty four per cent of the patients with node metastases and 16 per cent of those without node metastases in the combined colon and rectum group survived five years without evidence of disease. If the nodes show metastases the prognosis for five year survival in cases of carcinoma both of the colon and of the rectum is just about one half as good.

The author concludes that the grading of colon and rectal tumor is of definite value for prognosis. It is of less value however than the classification of these tumors according to their extent of spread as outlined by Dukes. A combination of these two methods may prove even more effective.

SAMUEL H. KLEIN, M.D.

#### LIVER GALL BLADDER PANCREAS AND SPLEEN

Stewart J. D. Prothrombin Deficiency and the Effects of Vitamin K in Obstructive Jaundice and Biliary Fistula. *Ann Surg* 1939 109 588

The author reports the results obtained in 13 patients of whom 12 had obstructive jaundice of varying degrees from liver damage and were given Vitamin K cholic acid mixture pre-operatively. Plasma concentrations of prothrombin and bilirubin were determined. The average increase in plasma prothrombin under Vitamin K therapy was 32.8 per cent. The average duration of treatment was three and nine tenths days with an average dose of 6.8 gm. The Vitamin K extract was prepared from fresh spinach according to the method of Dam.

The plasma prothrombin concentration in 5 patients suffering from massive postoperative hemorrhage given in 3 of these the Vitamin K cholic acid mixture was given immediately and the bleeding ceased with a dramatic rise in plasma prothrombin. One patient developed severe diarrhea when the mixture was given through a jejunostomy and the bleeding was uncontrolled. In another patient given the Vitamin K cholic acid mixture through a jejunostomy, there resulted a restoration of the plasma prothrombin and a control of the bleeding

tendency. The author noted that in only 1 patient observed in whom there was obstruction of the bile flow for more than a week, was there an associated plasma concentration level of less than 84 per cent. In this 1 case the patient's appetite remained good and the biliary obstruction was incomplete. There was a drop of from 20 to 40 per cent in plasma prothrombin concentration immediately after operation. This fall was only transitory if Vitamin K cholic acid feeding was resumed immediately. It was stated that a safe pre-operative plasma prothrombin level should preferably be above 75 per cent. Since these levels change frequently determinations should be made often and early during the postoperative period. There were 2 patients who refused to take the Vitamin K cholic acid mixture by mouth because it gave them epigastric distress after a consequent massive hemorrhage they operated by taking the mixture with a resulting rapid restoration of plasma prothrombin levels to normal and cessation of bleeding.

The author raises the question of the influence of infection on plasma prothrombin. He noted that the plasma prothrombin level fell whereas the plasma fibrinogen rose in a patient who developed bilateral severe pneumonia while receiving Vitamin K cholic acid therapy for severe hemorrhage. Likewise he noted that there was only a 6 per cent increase in the plasma prothrombin in an adult patient following a transfusion of 600 cc. of blood.

ROBERT ZOLLINGER, M.D.

Leinati F. Gangrene of the Round Ligament of the Liver (Sulla gangrena del legamento rotondo del fegato). *Clin chir* 1939 15 253

Leinati describes the case of a woman aged sixty seven years who suddenly developed severe pain over the entire abdomen accompanied by vomiting. She had frequently suffered from less severe attacks which were relieved in a few hours by hot applications. On admission a diagnosis of peritonitis probably due to perforating appendicitis was made but exploration showed the appendix and the adnexa to be normal. Prolongation of the incision upward revealed a thick cord running from the umbilicus to the hilus of the liver. Its color changed from pink to gray due to hemorrhagic infiltration close to the umbilicus to dark red then dark brown and black with greenish patches typical of gangrene. It was removed between two ligatures. Examination of the biliary tract revealed extensive cholecystitis and several calculi one of which was the size of a nut. Cholecystectomy was performed and the calculi were removed. Convalescence was uneventful. Histological examination of the removed cord showed practically total necrosis of the part in which the changes were most advanced and zones of fatty necrosis surrounded by granulation tissue which was in a more or less advanced stage of necrobiosis in the less altered parts. Even the part close to the umbilicus presented extensive necrosis of the various elements forming the cord but especially lipo-

necrosis Hemorrhage mostly recent was found all through the cord

This was consequently a case of gangrene of the round ligament of the liver the nature of which is not easy to explain Cases of pathology of this ligament in the literature are scarce excluding vascular changes occurring in cases of cirrhosis of the liver and abnormal permeability of the umbilical vein the literature reports only 5 cases of cyst 9 cases of sclerosis with retraction 8 cases in which the round ligament was found in an epigastric hernia 1 case of internal hernia through the falciform ligament and 1 case of the presence of a needle which had migrated into the cord fifteen years previously Only 1 of the cysts was of parasitic nature (*echinococcus*) The cases of fibrous retraction are of particular interest because they cause a syndrome characterized by postprandial gastric pain with acid eructations and epigastric oppression or pain on palpation above the umbilicus Hiccup has also been mentioned but does not seem to be characteristic of involvement of the round ligament It was not present in the author's case The occurrence of the syndrome of para umbilical pain with or without vomiting always of short duration over a number of years and at decreasing intervals of time recalls intermittent but progressive lesions of the round ligament which finally caused gangrene and peritonitis The absence of young or adult connective tissue formation and the presence of extensive fatty necrosis in all parts of the cord suggest the hypothesis of a liponecrosis of the part with gradually more frequent and more severe attacks which resulted in total gangrene through extensive thrombosis of the vessels The liponecrosis may have arisen through the irritation caused by the biliary lithiasis and the dilatation of the gall bladder The fact that after an acute abdominal syndrome lasting about twenty hours no peritonitis was found and that consequently there was no infectious process militates in favor of the concept that the gangrene was caused by thrombosis of the principal vessels which was induced by extension of the liponecrotic process

RICHARD KEMEL, M.D.

Brooks B. and Wyatt T. E. Surgery of the Gall Bladder *Ann Surg* 1939 109 334

A detailed history of the origin and progress of the surgical treatment of cholelithiasis is presented This is followed by a discussion of the 512 operations performed on the gall bladder and bile ducts over a period of twelve years in the Vanderbilt University Hospital

Acute cholecystitis has been treated conservatively with only 15 operations performed on the day of admission The authors believe there is little evidence in favor of emergency operations for acute cholecystitis because of the fear of development of gangrene or peritonitis

A right paramedian incision was used routinely and the majority of cases were drained with a small

cigarette drain There was a mortality of 2.5 per cent

There were 31 cholecystostomies for disease limited to the gall bladder with 4 deaths The authors report a relatively low incidence of common duct stone with only 29 operations performed for stones in the common duct They recommend closure of the common duct with a rubber tube anchored to the region of closure The mortality in the cases of stone in the common duct was 17.2 per cent

The results in all the cases operated upon except 38 were determined from letters or personal interviews, which made the ultimate results available in 92.6 per cent of the cases from one to twelve years after operation Seventy five per cent of the patients having cholecystectomies for inflammatory disease limited to the gall bladder were completely relieved of all symptoms It appeared that the results were better in patients having advanced pathological changes in the gall bladder wall than in those with little pathological change A somewhat larger proportion of the patients operated upon within three years reported themselves entirely well as compared to those who had been operated upon for a longer period

It was emphasized that the mortality from operations on the gall bladder has been changed but little in the past forty years ROBERT ZOLLINGER, M.D.

Eliason E. L. and North J. P. Morbidity Following Cholecystectomy *Ann Surg* 1939 109 580

The authors present a study of the end results obtained in 264 patients (available from a series of 504) who had undergone cholecystectomy It was found that cholecystectomy gave relief in 94 per cent of the patients whose cases were followed up The failures were discussed in 4 groups

In the first group there were 8 patients in whom an incorrect diagnosis of gall bladder disease had been made preoperatively Although these cases had been studied very carefully cholecystectomy was believed to be indicated None of the patients was benefited because the principal lesion was outside of the gall bladder although several were found to have calculi and pericholecystic adhesions One of the patients in this group after two years developed a huge carcinoma of the greater curvature of the stomach another had pylorospasms a third patient had acute serositis of the hepatic capsule and adjoining peritoneum with filmy adhesions as the result of a gonococcal infection originating in the pelvis A brief abstract of the 8 failures is presented

Eight patients were placed in a group classified as having had incomplete diagnosis These patients had definite cholecystic disease which was verified at operation but in addition other pathology was found to be responsible for their symptoms None of the unsatisfactory results in this group was due to undiscovered stones in the duct despite the fact that only 18 per cent of the total number of operations for inflammatory disease included exploration of the common duct The failures in this group were

due to the fact that the patient's suggestive symptoms were thought attributable to the gall bladder when in reality the gall tones were silent and not the chief source of the discomfort.

Fifteen per cent of the cholecystectomies were performed for chronic non calculous cholecystitis.

There was a third group of 5 patients who were not relieved of their symptoms until from six to sixteen months after cholecystectomy had been performed. The authors concluded that probably relief was not obtained in these cases until the ducts had had an opportunity to dilate and perhaps assume the function of the absent gall bladder.

There was a fourth group of so called extraneous complications which were not biliary in origin and which gave residual difficulty after operation. They were listed as right sided ureteral colic, ulcerative colitis with epigastric pain, pulmonary and joint tuberculousis with dyspepsia, tabes dorsalis with epigastric pain, subacromial bursitis of the right shoulder, hyperthyroidism and myocardial disease with fibrillation. The latter two were present both before and after the gall bladder operation.

This follow up study did not include any of the patients who had had cholecystotomy.

ROBERT ZOLLINGER M.D.

#### Diek J. C. Carcinoma of the Lower End of the Common Bile Duct. *Brit J Surg* 1939 26 757

Investigations as to the typical features of cancer at the lower end of the common bile duct are becoming of increasing importance and in recent years attempts at surgical removal of the cancer have been made with considerable success. The author's report comprising 13 cases gives the main characteristics of carcinoma in this situation and at the same time shows how hopeful the field is for the surgeon.

An analysis of 4,239 consecutive autopsies performed in the Glasgow Royal Infirmary shows that cancer of the gall bladder had occurred 20 times, cancer of the biliary tract 18 times and cancer of the ampulla of Vater 6 times. Altogether these cases represented but 1 per cent of all the autopsies yet the 18 cases of carcinoma of the bile ducts in 4,239 autopsies (0.42 per cent) showed that cancer in these passages is not so rare as is generally believed. Interesting facts were shown by an analysis of the numbers of cases with gall stones: 18 of 20 cancers of the gall bladder presented calculi whereas only 2 of the 18 cancers of the bile ducts were associated with stones in the gall bladder or bile ducts. The sex incidence also differed greatly in carcinomas of these situations. There were more than twice as many cases of cancer of the gall bladder in women as in men whereas bile duct cancer occurred only slightly more often in men than in women. The majority of patients the condition made its appearance between the ages of fifty and sixty nine years.

The majority of the author's cases of cancer of the lower end of the common bile duct presented a

similar macroscopical picture. The tumor was situated within the lower 2 cm. of the duct. Above the growth there was marked dilatation and sacculatation with deep bile staining of the wall of the duct. The dilatation extended back into the hepatic ducts and the small bile ducts within the liver. In a few instances suppurative cholangitis was superadded. The cystic duct and the gall bladder were also dilated. At the lower end of the common bile duct the tumor caused stenosis amounting to almost complete obstruction. The tumor was usually very small in extent and might easily have been mistaken for cicatricial contraction after ulceration following the passage of a gall stone. Local extension and secondary growths in this type of cancer were unusual—a fact that has attracted the attention of others and has proved to be one of the chief indications for the attempt at surgical removal when this condition is suspected. Histologically most of these tumors were adenocarcinomas.

Various suggestions as to the cause of carcinoma in the bile ducts have been advanced.

1. Carcinoma develops on a simple papilloma in this region as it is known to occur in other regions e.g. in the intestine or in the bladder.

2. Mayo Robson thought that gall stones were a more important factor. Ewing also suggested that the trauma due to calculi might be one of the causes. Most other observers, however, have shown that gall stones are not frequently present in such cases in contradistinction to cancer of the gall bladder. The present series also discredits the importance of gall stones as a causative factor in carcinoma of the bile ducts.

3. Rolleston was of the opinion that carcinoma might arise on an old ulcer in this situation as in gastric carcinoma. However the author does not find this to be true. JOSEPH K. NARAYAN M.D.

#### Pavlovsky, A. The Treatment of Acute Pancreatitis. (El cuadro actual del tratamiento de las pancreatitis agudas). *Bol Soc de Ciruj de Buenos Aires* 1939 (10 3)

The high operative mortality of acute hemorrhagic pancreatitis has induced many authors to investigate the cause of this condition. Pavlovsky thinks that today there is a tendency to use the same treatment for the many different types of acute pancreatitis. Some authors consider operation the treatment of choice while others do not favor operation. A certain amount of confusion exists on this point.

Pancreatitis may be classified as follows: (1) classic acute hemorrhagic pancreatitis, (2) acute edema of the pancreas with all of its variations, and (3) serous hemorrhagic apoplexy of the pancreas.

1. The clinical symptoms of acute hemorrhagic pancreatitis are classic. Operation shows cytotoxic necrosis of the gland, the peritoneum and the omentum. In addition there is a hematoma or hemorrhage and often acute distention of the biliary ducts associated with a gall bladder filled with stones.

Pavlovsky believes that the condition in all cases in this group can be improved by operation and that in none will it show improvement following non-operative measures. Surgery consists chiefly of relief of the tension of the biliary tract by means of cholecystostomy and drainage of the necrotic focus in the pancreas. The author concludes that only operative measures can give any hope of success even if the rate of mortality is very high.

2. Acute edema of the pancreas has received the attention of many authors in recent years. The author believes that as the condition does not always precede acute hemorrhagic pancreatitis the treatment may be non-operative and should be as energetic as possible. In this way emergency operations with all their dangers can be avoided. If we study the clinical records of many patients with acute biliary colic we very often find that during the attacks there is abdominal pain with irradiation to the back, as well as a certain degree of peripheral shock. These symptoms show the involvement of the pancreas and indicate the urgency of an operation designed to correct the biliary disease.

Medical treatment consists of the injection of hypertonic saline or hypertonic glucose solution, the administration of cardiac tonics, adrenalin or epinephrine, caffeine or camphor derivatives and in serious cases blood transfusions.

Recovery is very slow, often requiring two or three days, but the best procedure is to wait and operate later when the patient is in better condition.

The author states that early operation in acute edematous pancreatitis has given poor results, as the mortality is around 50 per cent. Some authors believe that operation should be avoided in every case as the distinction between edematous and hemorrhagic pancreatitis is quite difficult. The statistical results are very different, the mortality ranging from 0 to 22 per cent.

The distinction between the two kinds of pancreatitis can be made through observation of the symptoms, especially at an early stage of the condition. If energetic clinical treatment gives no success, the hemorrhagic form is suggested. The alarming symptoms of edematous pancreatitis very often complicated by hepatic colic respond slowly to medical treatment. On the other hand the persistence of a serious condition indicates the possibility of a hemorrhagic pancreatitis. Chemical examinations give modifications of the normal values in both forms.

3. Serous hemorrhagic apoplexy of the pancreas. According to the new concepts of Gregoire, Silvestri and others, acute pancreatitis is the result of a general disturbance with special emphasis on the pancreas depending on local conditions. Hemorrhagic congestion is produced through excitation of the splanchnic nerve. Visceral hemorrhage is the consequence of a circulatory change produced by disturbances of the neurovegetative system. The lesion may be chemical or physical, the important thing is the involvement of the vasomotor centers.

Many cases in which the classical picture of acute hemorrhagic pancreatitis was the cause of death did not reveal any lesion of the biliary tract. The only explanation which could be given was the existence of neurovegetative lesions. Sometimes the difficulty was in the liver if the hepatic cells failed in their function the liver could not prevent severe shock, and the pancreas was the site of a congestive hemorrhage caused by the suppression of essential functions of the liver.

The symptoms are extreme epigastric pain, peripheral collapse, descent of the blood pressure and in contradistinction to hemorrhagic pancreatitis, a very marked resistance of the abdominal wall.

Operation shows an infiltrating edema of varied extension including the gland and the depending omentum. Stains of cytosteatonecrosis are exceptional. The biliary tract seldom presents lesions.

Treatment must be very energetic, adrenalin must be given to combat shock and hepatic insufficiency must be overcome.

Gregoire and Couvelaire think that operation must be performed for the following reasons: diagnosis is never certain, medical treatment very seldom gives relief from pain and the pancreas must be explored because of the possibility of a necrotic focus which may need a special type of drainage.

HECTOR MARINO, M.D.

## MISCELLANEOUS

Gutierrez, A. Drainage of the Abdominal Cavity (Del drenado de la cavidad abdominal). *Rev. de cirugía de Buenos Aires* 1938 p. 610.

The lack of asepsis and imperfections of technique were the reasons that made surgeons advocate abdominal drainage very strongly. However with the perfection of operative technique we see the first reaction against this practice and today abdominal drainage is very restricted.

The author divides drainage into two types: preventive and obligatory. Preventive drainage is done when the operation is finished and there are doubts about a suture or a hemorrhage is feared.

As for the methods employed to increase the defenses of the peritoneum, the author thinks that none is successful.

Gutierrez advocates short drainage after surgery of the bile duct and uses a rubber tube or a strip of gauze. After a cholecystectomy he prefers a thin rubber tube placed near the stump of the cystic duct which is left in place from twenty-four to forty-eight hours.

Whenever the bed of the gall bladder has not been covered he leaves a narrow strip of gauze. In some cases he has seen a small quantity of bile discharging from the drain.

To all infected cases he drains the common duct, as soon as the bile comes out clean he tyndallizes it and gives it back to the patient.

Usually he does not leave any drain after gastric surgery but if there is any doubt about the closure

of the duodenal stump he leaves a rubber tube as a measure of prevention

In acute appendicitis he never employs a drain if the appendix is intact in the case of a gangrenous appendix he leaves a tube If there is diffuse peritonitis he always employs a drain

The author does not agree with Ombredanne who closes the abdomen in all acute cases as he has seen many deaths caused by this procedure

In gynecological surgery he employs drainage only exceptionally usually he uses a piece of rubber tubing sometimes a narrow strip of gauze He has found drainage according to Mikulicz to be bad practice

For drainage of the pouch of Douglas and for drainage of the pelvis after total hysterectomy he uses a piece of rubber tubing

HECTOR MARINO M D

#### Desjardins A U Retropertoneal Lymph Nodes Their Importance in Cases of Malignant Tumors *Arch Surg* 1939 38 714

In view of the fact that malignant tumors may metastasize through the lymphatic channels or spread from one group of lymph nodes to another along the lymphatic channels the retropertoneal nodes are the most important lymph nodes in the body Because of their relative inaccessibility little attention has been given to them and the relation between certain clinical symptoms and physical signs and the pathological involvement of this group of nodes is often overlooked

Carcinoma of the bladder prostate uterus or rectum often extends backward and causes dull pain in the sacral region In addition symptoms caused by extension of the tumor beyond the organ primarily affected may be backache pain in the abdomen bloating belching enlargement of the abdomen and constipation With dull backache without evidence of skeletal metastasis pain most probably is due to metastasis of the tumor to the abdominal lymph nodes Abdominal pain and fullness after eating accompanied by other symptoms mentioned vary and often cause the patient to undergo surgical resection of other organs The physical signs are sometimes not clear but careful palpation will disclose a sense of deep resistance of the affected group of nodes accompanied by slight or moderate tenderness

Malignant neoplasms of the testis and ovary save in those cases in which rupture of the capsule in the former has produced superficial inguinal metastasis or in which peritoneal implantation of malignant cells of the latter has caused ascites metastasize directly into the upper para aortic nodes and produce symptoms and physical signs as mentioned previously

Involvement of these nodes is still more important in lymphoblastoma (Hodgkin's disease or lymphosarcoma) It is generally taken for granted that this variety of tumor always begins in the cervical nodes and thence extends to other groups of nodes This is

far from true In a considerable proportion of cases the malignant process first affects the retropertoneal nodes and gradually spreads to the nodes in other regions Almost invariably the retropertoneal nodes are involved sooner or later regardless of the site of initial involvement

The onset of symptoms is usually insidious pain often is either absent or moderate inconstant or interrupted by more or less prolonged remissions so that many patients have distress for months or years before seeking to know the cause and have it removed Unfortunately the frequency of primary or secondary involvement of the para aortic or mesenteric nodes is so seldom realized that the factors responsible for the patient's symptoms go unrecognized for a long time A striking feature is the great variety of the symptoms and this perhaps more than anything else accounts for the difficulty which those who have not examined and followed a large number of patients with the disease have in recognizing the character and the cause of the patient's difficulties One patient may complain wholly of impairment of vision thickening of the lids or bulging of the periocular tissues another may complain of pain in one of the abdominal quadrants and may already have undergone cholecystectomy or appendectomy with only temporary relief another patient's chief complaint may be itching which having been confined for a time to the lower or upper extremities has gradually extended to the entire body and has become so severe that restful sleep has become impossible the principal difficulty of another patient may be pain in the back which extends to one or both lower extremities another may have as his chief symptom an afternoon fever which may be continuous or may occur in intermittent waves another may suffer mainly from pain in the stomach which occurs from a half to three hours after meals the chief complaint of another may be loss of weight another may complain of amenorrhea And yet all these patients may be suffering from Hodgkin's disease or lymphosarcoma which affects the retropertoneal nodes only or affects groups of nodes in other regions as well

Because of the great variation in the symptoms and the protean complications which may develop during their course Hodgkin's disease and lymphosarcoma can simulate many diseases So true is this that as experience accumulates an increasing proportion of the baffling diagnostic problems prove to be lymphoblastoma and in many such cases the malignant process has originated in the retropertoneal nodes The diagnosis can be made without biopsy in a large percentage of cases Indeed an excised node may not display the typical findings to enable the pathologist to make a positive diagnosis and the condition may be reported as inflammation or as a highly undifferentiated carcinoma

A feature of lymphoblastomatous involvement of the retropertoneal nodes is the variation of symptoms from time to time In relation to its importance too much attention is given to peripheral





# GYNECOLOGY

## UTERUS

**Tyrone C. H.** Complete Tears of the Perineum Preparation Operative Technique and Treatment After Operation *Surgery* 1939 5 653

The author reviews the cases of 63 patients who were operated upon for complete tear of the perineum. Perfect control of the anal sphincter was obtained in 49 (86 per cent) of the patients and partial control in 7. There were but 2 failures.

Success in obtaining perfect results is dependent upon the preparation, the choice of operative procedure and to a great extent upon the treatment following operation. In order to provide complete restoration of the lost sphincter control, the procedure chosen should be the one that is best adapted to the extent of damage of the structures.

Regardless of the technique that is followed, the following precautions should be observed: (1) free dissection and excision of all scar tissue; (2) the insertion of sutures to allow for swelling and to guarantee freedom from tension along the suture line; and (3) the avoidance of dead spaces.

Following the operation, treatment should be such as to make certain there will be no movement of the bowel for at least even days or until healing is effected. The perineal region must be kept as nearly sterile as possible and at the same time the traumatizing effects of enemas, douches and rectal tubes must be carefully avoided.

CHARLES BARON, M.D.

**Kotz, J. and Parker, E.** The Clinical Interpretation of the Endometrial Biopsy *Endocrinology* 1939 24 447

This paper is based on endometrial biopsies from 300 patients who apparently were suffering from ovarian dysfunction. They complained of amenorrhea, menorrhagia, metrorrhagia, menopausal symptoms, sterility and dysmenorrhea. A specimen of endometrium was obtained two or three days before the expected onset of a menstrual period. When there were marked menstrual irregularities, the biopsy was taken in from twenty-two to twenty-six days after the last period if menstruation did not occur within from five to seven days thereafter, the biopsy was repeated until one was obtained just prior to the flow. In cases of amenorrhea and prolonged bleeding, a biopsy was taken every week for several weeks and the specimen showing the most growth and differentiation was used. Unless due consideration is given to the time relation of the biopsy to adjacent periods of bleeding, a study of endometrial biopsies is of little value.

The endometrium does not respond as a whole to hormonal stimulation. The mucosa in the fundus shows the most marked development and that near the cervix may show little or no reaction. Therefore

these biopsies were obtained with a suction curette by making four downward strokes from the fundus.

An endometrium to be diagnosed as pathological may vary from the normal in two ways. The histology of the phase may be normal but the time of its occurrence in the cycle does not conform to the normal; on the other hand, the structure of the endometrium may be pathological. The following endometrial patterns were recognized:

**Atrophic follicular.** Only fragments of epithelium were obtained for biopsy. The tissue consists of a loose stroma in which a few small follicular glands are present.

Such endometrium represents the most profound type of ovarian failure. Not only is there an absence of corpus luteum function but there is also a failure of follicular hormone. This type of endometrium is always encountered after a cessation of menstrual function.

**Persistent follicular.** The development of the endometrium is not as advanced as it should be for the time at which the biopsy is taken. The follicular reaction is still present when under normal conditions there is luteal differentiation.

**Hyperplastic follicular.** The glands are increased in number and vary considerably in size, shape and distribution. There is an increase in the number of cells of the glands which leads to an increase in the thickness and an infolding of the epithelium which often results in islands of epithelium within the gland lumen. Mitoses are frequent.

**Cystic follicular.** The glands show marked irregularity in size and shape; many are dilated to the point of cyst formation. The stroma is dense. This is the Swiss cheese endometrium.

**Delayed postovulatory.** The authors look upon subnuclear vacuolization as a characteristic feature of the postovulatory phase. They believe that subnuclear vacuolization occurs within from twenty-four to seventy-two hours after ovulation. They observed this phenomenon as early as the sixteenth day of the cycle and as late as the sixtieth day.

**Normal secretory.** Normal secretory endometrium can be developed even after four months of amenorrhea. Bleeding may occur from endometria exhibiting varying degrees of secretory differentiation. However, once a secretory reaction has developed, uterine bleeding always follows shortly thereafter.

**Loose or spongy secretory.** The stroma remains loose and spongy. The epithelial cells never attain a high columnar type or show secretory activity. The glands appear tubular with marked dilatation of the lumen. This endometrium gives the impression of a persistence of the hormonal balance which is considered characteristic of the earliest part of the secretory phase.

**Mixed.** This term denotes the simultaneous occurrence of follicular and luteal characteristics.

certain degree of mixture is physiological and consequently this diagnosis is made only when the general endometrial pattern is a mixture of the two types. In most cases with a mixed pattern other abnormalities also were present e.g. incomplete secretory reaction, hyperplasia and cysts.

**Glandular hyperplasia in the luteal phase.** The glands were larger than normal with excessive proliferation of the epithelium which resulted in rather bizarre infolding of the epithelium. The secretory reaction was less than normal. The stroma was dense.

**Glandular hypoplasia in the luteal phase.** There are two types. In one type the glands may be few in number, small in size, and may show very little secretory reaction; the stroma is midway between follicular and secretory, and cysts are common. In the second type, glands are of normal number but small proliferation and secretory differentiation both appear to be deficient.

**Cystic endometrium.** Cystic dilatation of the glands was found in every type of endometrium, this abnormality *per se* is of little practical importance.

In attempting to correlate the biopsy findings with clinical symptoms the authors conclude that there are no specific endometrial patterns for the various menstrual disorders. Amenorrhea is a possible exception here; the endometrium is usually in a stage of follicular arrest or atrophy. Specific changes are not demonstrable in the menopause but the endometrium merely reflects the degree of ovarian failure. Oligomenorrhea and polymenorrhea occurred with practically every type of endometrium. The occurrence of bleeding from all types of endometrium suggests that another element, the bleeding factor, is a necessary activator of the bleeding phase of the menstrual cycle.

The ovarian endometrial cycle is a labile phenomenon in which a definite sequence of events normally occurs but to which specific time limits cannot be attached. Any disturbance in the normal balance of ovarian hormones is reflected in the structure of the endometrium. Consequently the endometrial biopsy is the most efficient and the simplest method of determining ovarian function.

GEORGE H. GARDNER, M.D.

Mikulicz Radecki F. von. The Treatment of Cervical Carcinoma in the Koenigsberger University Women's Clinic in the Years from 1910 to 1937. *Strahlentherapie* 1938 63 414.

The article contains three complete statistical surveys on cervical carcinoma covering the years from 1910 to 1918, 1919 to 1925, and 1925 to 1932. These divisions are made in accordance with the activities of Winter and Zangemeister as directors of the Clinic. Up to 1925 treatment of cervical carcinoma in this clinic was chiefly operative (from 1910 to 1918 52 per cent operative and from 1919 to 1925 26 per cent operative). The operated cases included carcinoma in Stages 1 and 2. In the first of these two periods the relative cure of the operated

cases was about 25 per cent in the second period it was increased to 30 per cent by total vaginal extirpation and decreased to 17 per cent by the Wertheim operation. In the latter period radiation treatment was becoming more important; it had produced cures in 21 per cent of cases in Stages 1 and 2 but only in 5 per cent of those in Stages 3 and 4. In the third period (1925-1932) Zangemeister and Wieloch found the operable cases in Stages 1 and 2 to amount to 46 per cent but only 9 per cent were operated upon. The relative cure of these cases which were operated upon was 53 per cent which in contrast to the earlier periods was very good. Radiation treatment also showed considerable advance of the operable cases treated by irradiation 34 per cent were cured. However intensive irradiation especially with radium caused a large number of radium injuries particularly of the rectum.

The author adds a summary of his own cases of cervical carcinoma for the years from 1932 to 1937. Of these he operated 34 per cent with a primary mortality of 4.4 per cent and irradiated the rest with a primary mortality of 3 per cent. Since in these cases the longest observation period offered is five years, only the year 1932 can be considered. The cases of this year present the following results.

Of 7 cases in Group I, 6 were operated upon and 1 was irradiated; all were cured. Of 18 cases in Group II, 6 were cured by operation and 12 terminated fatally, on the average after one and one half years. Twenty-four cases in Group III were irradiated; only 2 patients are still living, the rest died on the average after two and one half years. One case in Group IV was not influenced by irradiation. The summary therefore does not give a clear picture of the probable cures for this clinic.

The author favors operation as the most promising procedure in the cure of cervical carcinoma and also gives the technique of a combined radium and röntgen irradiation method for cases which are no longer operable. (F. SIEGERT) RONALD R. GREENE, M.D.

#### ADNEXAL AND PERIUTERINE CONDITIONS

Cotte G. and Mathieu J. Ovarian Endometriosis (L'endométriose ovarienne). *Gynéc. et obst.* 1939 39 81.

Cotte and Mathieu note that in a series of 78 cases of endometriosis recently reported they found 22 in which the ovary was involved. Since that time they have had another case of ovarian endometriosis, which brings the total number of cases studied to 23. The ovary alone was involved in 8 of these 23 cases, the ovary and the uterus in 7 cases, the ovary and the peritoneum in 3 cases and there was diffuse endometriosis with ovarian involvement in 5 cases.

Ovarian endometriosis may produce acute symptoms of bleeding and collapse simulating tubal pregnancy. Only 1 of the authors' cases was of this type. Dysmenorrhea is the most characteristic symptom of ovarian endometriosis; it was the chief symptom in 12 of the authors' 23 cases and in some cases it was

very severe. In some cases dysmenorrhea is the only symptom but is more frequently associated with intermenstrual pain, pollakiuria or intestinal symptoms. In such cases the symptoms and the palpable tumors simulate cystic ovaritis. In 2 cases the symptoms and the presence of an adnexal mass simulated salpingitis. In cases in which ovarian endometrio is associated with endometrio is of the uterus of other organs or of the peritoneum symptoms of ovarian involvement are light and often overlooked.

There are three anatomical types of ovarian endometrio: the first presents an enlarged cystic ovary with a single cyst or multiple cysts; the second presents a sclerotic ovary, little if any enlarged and containing small multiple cysts; and the third presents small dark nodules involving the ovary and neighboring structures, especially the pouch of Douglas and the posterior surface of the isthmus.

As the diagnosis of ovarian endometrio is often cannot be made except at operation, the authors advocate surgical treatment. In case of endometriosis involving only one ovary, removal of this ovary with conservation of the healthy ovary is indicated if the opposite ovary is not involved at the time of operation; there is little danger of recurrence. If both ovaries are involved, both must be removed but hysterectomy is not indicated if there is no uterine involvement. In diffuse endometriosis with ovarian involvement, bilateral castration is indicated and hysterectomy is often necessary; an exception may be made when only the peritoneum and one ovary are involved. In such cases the removal of the diseased ovary and of subperitoneal endometrial plaques is sufficient. In case of associated uterine lesions in women over forty, hysterectomy with removal of both ovaries is usually indicated. Also in younger women with massive involvement of both ovaries and uterine fibroma, the radical operation is indicated. In cases with unilateral ovarian involvement and a uterine fibroma that can be removed easily, a conservative operation can be done. In cases of recurrence in which dysmenorrhea is the chief symptom, radiotherapy gives good results, but when there are constant symptoms not related to the menstrual period the authors prefer a hysterectomy. Radical operation was done in only 1 of the 8 cases in which the ovary alone was involved. Of the cases in which conservative operation was done, 2 were recent, 1 was complicated by Hodgkin's disease and 3 resulted in cure. Two of the last patients subsequently became pregnant. In the seventh case there was a recurrence cured by secondary hysterectomy. The radical operation was done in 5 of 7 cases with involvement of the ovary and uterus; a conservative operation in 2. One of the latter has been operated only recently; in the other case a secondary hysterectomy was necessary. In all 3 cases with involvement of the ovary and peritoneum, a conservative operation was done; in 2 the results were good, 1 case has not been followed up. A radical operation was done in all 5 cases of diffuse endometriosis with ovarian involvement. Of the 11 cases

in which bilateral castration was necessary, 3 have presented severe menopausal symptoms.

ALICE M. MEYERS.

**Mathieu J.** The Prognosis of Primary Malignant Epithelial Tumors of the Ovary (Etat actuel du pronostic des tumeurs malignes épithéliales et primitives de l'ovaire). *Gynécologie* 1939 33 63.

Mathieu notes that the clinical symptoms as a rule do not clearly indicate the prognosis in ovarian tumors. The operative findings are of greater importance. Large solid tumors, especially if showing some necrosis, indicate a poor prognosis even if there is no peritoneal involvement. In 4 cases of this type, 15 of the patients died within 18 months. Simple cyst or those with few vegetations are usually benign, although there are exceptions.

Vegetative tumors if well encapsulated are usually benign of 43 such tumors with a fibrous capsule, only 12 showed evidence of malignancy. In 43 cases of tumors not well encapsulated, 25 ran a rapidly fatal course. In vegetative tumors, the author has found that the best histological indication of malignancy or non-malignancy is the origin of the tumor—whether from the germinal or the wolffian tissue. He was unable to identify the origin of the tumor in only 10 of 86 cases. Tumors originating in the germinal tissue are more benign than those originating in the wolffian tissue. In the author's cases, the prognosis made on this basis was wrong in only 15 per cent.

In solid epithelial tumors of the ovary, the author has been unable to determine any histological characteristics that are definitely indicative of malignancy or non-malignancy. Tumors which show a definite endocrine effect are less likely to be malignant than solid ovarian tumors in general. These include folliculomas, arrhenoblastomas, and seminoma. The author has found that folliculomas particularly are benign. 6 per cent of his patients with this type of tumor having a long survival after operation. Further study of the nature of ovarian tumors is necessary before the prognosis can be more definitely determined.

ALICE M. MEYERS.

## EXTERNAL GENITALIA

**Custo E. L.** The Vaginal Mucosa in Relation to Ovarian Function (La mucosa vaginale della donna in rapporto alla funzionalità dell'ovario). *Folia demographica gynec.* 1939 36 57.

The author first presents a review of the literature pertaining to the relation of the vaginal mucosa to ovarian function, beginning with the first work of Moreau in 1889 to the modern studies of Diecks, Zondek and Clauberg. He then proceeds to describe his personal studies and experience based on 30 vaginal biopsies done at various ages during different phases of the menstrual cycle, and during different periods of the sexual life. Numerous photomicrographs and illustrations are presented of the histological appearance of the vaginal mucosa under these various conditions.

The author found that there is a cycle in the structure of the vaginal mucosa that there are considerable individual differences as well as differences in various parts of the vagina and that such varied factors as chemical, bacterial, and mechanical influences as well as hemorrhage and an ambulant condition may alter the vaginal reaction. The anatomical and functional integrity of the sexual organs is necessary for the study of the changes during the menstrual cycle. During pregnancy the vaginal epithelium hypertrophies and shows vacuolization of the basal stratum; the hypertrophy is apparent even on the sixth day of the puerperium. During the menopause the vaginal epithelium is at rest.

In a case of carcinoma of the cervix during the menopause the vaginal mucosa was found at rest. In a fibromyoma of the uterus in a sexually functioning adult the epithelium was normal in extent but did not correspond with the phases of the menstrual cycle.

There is an extensive bibliography of the entire subject.

JACOB E. KLEIN, M.D.

Foss, G. L. Further Developments in the Treatment of Kraurosis, Leucoplakia, and Pruritus Vulvae. *J. Obst. & Gynaec. Brit. Emp.* 1939 46: 271.

When the body is deprived of the follicular hormone all tissues which are normally dependent on it for their growth and development atrophy and assume senile characteristics. The vagina, labia, and clitoris lose their elasticity and atrophy. The introitus becomes narrowed; often the vagina is constricted and the vaginal mucosa is thin.

Other authors have shown that patients with pruritus, leucoplakia, kraurosis, and vulvovaginitis may also have an achlorhydria. Since all women suffer an estrin reduction yet only a few develop some type of vulvovaginitis, it seems possible that hypochlorhydria or achlorhydria together with Vitamin A deficiency may be of importance in the development of these inflammatory lesions.

Biopsies of the vestibule in kraurosis and of the labia in leucoplakia reveal that adequate treatment with large doses of estradiol completely alters the appearance of the mucosa.

Of 48 patients treated 38 were given injections of estradiol benzoate twice weekly and as improvement occurred the injections were reduced to once a week.

At the beginning of treatment the doses ranged from 10 to 25 mgm.; they were gradually decreased. After the introduction of efficient local treatment with ointment or suppositories and oral therapy with hydrochloric acid the very high doses such as 25 mgm. were not found necessary.

Local treatment was given to 42 patients in the form of ointment of different strengths of estrone, estradiol, or estradiol benzoate in various bases and in suppositories containing estradiol. Of the patients who did not receive local treatment one suffering from slight leucoplakia found relief from

cod liver oil and hydrochloric acid taken by mouth; another patient suffering from early kraurosis obtained benefit with the same oral treatment and implantation of estrone and the remaining 4 patients received estrone by injections and orally.

Tablets of estrone or estradiol in doses ranging from 15 to 120 mgm. were implanted in 15 patients the purpose being to obtain information about the rate of absorption so that adequate dosage could be calculated for the average case. In most patients the doses used were not adequate to obtain relief without the aid of local therapy.

Very few patients obtained complete and lasting comfort and nearly all complained of slight relapses, but they were quickly brought under control by additional local therapy or a few injections. The more severe cases need almost continuous substitution therapy in one form or another, but ordinarily suppositories or ointments maintain these patients in a fairly comfortable state.

GEORGE H. GARDNER, M.D.

## MISCELLANEOUS

Novak, E. Clinical Syndromes Referable to Failure of Ovulation. *Am. J. Obst. & Gynec.* 1939 37: 603.

Failure of ovulation occurs not infrequently in ostensibly normal women and is the responsible factor of some cases of sterility and of the most frequent variety of functional bleeding.

With reference to the former problem there is, after all much analogy between the two sexes. The more cases of sterility the author sees the more impressed he is with the frequency and importance of the male factor. Complete aspermia is not at all infrequent in men who otherwise seem quite normal in whom there is no history of gonorrhea, mumps, or other infections and in whom the genito-urinary specialist finds no evidence of infection of the prostate, or seminal vesicles. The same statement can be made as to necrospemia, which likewise is a frequent finding. That cases of anovulation in women or cases in which defective ova lead to early and perhaps repeated abortion are of endocrine causation, probably of pituitary origin, seems certain. It is important to recognize these abnormalities of ovulation, even though further developments must be awaited before treatment offers any hope of consistent success.

The same fundamental defect, failure of ovulation, is concerned in the most common variety of functional bleeding and likewise implies primarily a pituitary dysfunction. If one could bring about ovulation therapeutically in such cases the problem would be attacked at its source. A promising field of investigation in the effort to find a means of promoting ovulation in non-ovulating women is the study of the effects upon the ovaries in ovulating and non-ovulating women of the gonadotropic principles found in the blood serum of pregnant mares.

EDWARD L. CORNELL, M.D.

**Natale P. Primary Mortality and Morbidity in Gynecological Radium Therapy (Mortalità e morbidità primaria nella radioterapia ginecologica) Tumori 1939 25 215**

The material of Natale includes 1587 cases of cancer of the female genitalia treated with radium at the Vittorio Emanuele III National Institute of Milan from May 1928 to the end of 1937. Among these cases were 962 of the portio, 265 of the cervical canal, 73 of the endometrium, 120 of the vagina and vulva and 167 recurrences. Twenty patients died within one month after termination of the treatment giving a primary mortality of 1.26 per cent but as at least 5 of these died from intercurrent diseases unrelated to the treatment the mortality should be reduced to about 1 per cent. All authors agree that the principal and nearly only cause of death after radium treatment is of an inflammatory nature. In the present series infection accounted for 7 deaths, cardiac insufficiency for 4, cerebral embolism and bronchopneumonia for a each and anemia, glomerulonephritis, uremia, cachexia and shock for 1 death each. The lethal infections consisted of 2 cases of parametritis, 4 cases of peritonitis and 1 case of septicemia. Infection is a frequent complication but rarely leads to death; it is favored by the presence of a profuse bacterial flora in the carcinoma, by the rather frequent pre-existence of inflammation of the adnexa and by the decrease in the defense powers of the vagina and is aggravated by the destructive action of the radium and stagnation of detritus which highly favors bacterial development. The 4 patients who died from cardiac insufficiency presented cardiac defects but no signs of decompensation before the beginning of the treatment; the insufficiency occurred during the treatment in 3 and immediately after the treatment in 1. The 2 deaths due to cerebral embolism occurred on the third and thirteenth days after the treatment respectively. While a direct or indirect causal relationship between the treatment and the deaths due to infection, cerebral embolism, shock, cardiac decompensation and glomerulonephritis may be admitted, there is no doubt that this relation must be excluded in the cases of anemia, uremia, cachexia and bronchopneumonia.

A number of complications were observed; they were serious in 191 patients or 12.04 per cent and slight in 633 patients or 39.86 per cent; this left 743 cases or 46.84 per cent in which the course was normal. If the uterus alone is considered there were 1300 cases with a primary mortality of 1.31 per cent, serious complications in 171 or 13.15 per cent and slight complications in 530 or 40.77 per cent. In the remaining 582 cases or 44.77 per cent the course was normal. However, it should be noted that the slight complications included even small rises of temperature occurring for one day only and other minimal disturbances that had practically no clinical importance. In their order of frequency the complications, whether serious or slight, were rises of temperature not due to localized inflammation, localized infection, vesical lesions, proctitis, circulatory disturbances, hemorrhage, prostration, acute nephritis and ulcer of the posterior fornix (1 case each of the latter 2). As complications are so very frequent, all efforts must be bent to prevent them; disinfection of the cervix is indicated in all cases. Serum and vaccine therapy has been recommended and encouraging results have been obtained at the Institute by local applications of vaccines (Bezredka's method). Preliminary roentgen treatment, the application of 1 radium tube in front of the portio for twenty-four hours, and systematic electrocoagulation have been preconized.

The radium treatment was given in one protracted stage until the dose considered necessary was reached, but the tubes were removed every other day for disinfection of the tubes and of the parts. The tubes were kept in place with gauze tampons or by moulages according to the individual case and contained 5 or 10 mgm of radium element filtered with 1 mm of platinum for the uterus and 2 mm of platinum for the vagina, each tube being covered with non-metallic rubber. The needles contained from 1 to 3 mgm of radium element filtered with 0.5 mm of platinum. Various combinations of tubes were used depending on the extent of the lesion to be treated. In order to avoid inflammatory complications, stagnations of exudates must be prevented and the treatment eventually suspended if fever appears.

RICHARD KEMEL, M.D.

# A CONSIDERATION OF THE CAUSE OF THE ONSET OF LABOR

## Collective Review

D N DANFORTH, Ph D, M D, New York, New York

A C IVY Ph D, M D Chicago, Illinois

THE cause of the onset of labor has long been a problem of interest to both philosophers and scientists. In spite of an enormous literature upon the subject there has been no complete explanation of the phenomenon. Within recent months isolated fields have contributed significant data which bear upon the subject. Also much progress has been made by those primarily interested in this question. This report is submitted in the hope that the material which is here presented may serve to correlate this evidence in such a manner that it may prove of value in the ultimate solution of the problem.

At the outset, one should remember that a theory for the onset of labor should be capable not only of explaining the spontaneous onset of labor at term but also of being fitted to those instances in which labor is artificially induced or suddenly precipitated in women not at term.

In reviewing this literature in the light of our present knowledge the following subjects should be discussed:

- I The rôle of nervous mechanisms
- II The present concept of the rôle of the estrogenic and progestational hormones
- III The rôle of the placenta
- IV The effect of mineral ions upon the uterus
- V The effect of the estrogenic and progestational hormones upon mineral metabolism
- VI Alterations in blood volume, blood proteins and acid base balance in pregnancy

(In the following paragraphs the terms "estrin" and "progestin" are used to connote, respectively, the estrogenic and progestational hormones, and are to be distinguished from such substances as estrone and progesterone, which are highly purified products.)

### I THE RÔLE OF NERVOUS MECHANISMS

It is apparent that the extrinsic nerves are entirely unnecessary for the spontaneous inception

and maintenance of labor (136, 98, 66, 47, 157, 100, 111, 17, 81, 91). That they may be concerned under abnormal conditions is exemplified by the occurrence of labor as the result of profound emotional disturbance (65). However, the facts that placentaion, pregnancy and parturition may proceed unhindered after transection of the spinal cord or after lumbar sympathectomy, or after section of all the extrinsic nerves and removal of the uterovaginal ganglion in the dog (Ivy) are adequate proof that under ordinary circumstances these mechanisms are not necessary to the normal course and termination of pregnancy.

The rôle of the intrinsic uterine plexuses (25, 154) is debatable, since they are obviously concerned in certain special instances, but apparently not in others. These special cases include the induction of labor by dilating bags, or by rupture of the membranes, or other types of mechanical stimulation of the uterus. Local mechanisms may likewise be involved, when labor must be attributed to reflex stimulation, for example, through the use of enemas. It should be remembered, however, that the uterus is a notoriously refractory organ and unless it is fully prepared to do so, it will not react to these or to any other stimuli (94). Furthermore, those who believe that the stimulation of intrinsic nervous or neuromuscular structures by a growing fetus is responsible for the spontaneous onset of labor will have difficulty in explaining the delivery of placentas at term when all of the attached fetuses have been removed earlier in the period of gestation (92).

The experiments of Reynolds and others (142) stress the rôle of distention of an estrin primed uterus as a precipitating factor in labor. This theory is not inconsistent with other data in this communication. That the distention of a sensitive uterus may contribute toward the spontaneous termination of the pregnancy is a consideration of importance which cannot be overlooked.

## II THE PRESENT CONCEPT OF THE RÔLE OF THE ESTROGENIC AND PROGESTATIONAL HORMONES

The present day concept of the onset of labor is based for the most part upon evidence of the effects of the female sex hormones upon the motor activity of the uterus. The literature upon this subject is most voluminous and only the more pertinent contributions will be mentioned.

It has now been demonstrated to the satisfaction of most workers that pure estrin in any of its special forms is specifically necessary for the initiation and maintenance of co-ordinated rhythmic motility of the normal uterus (59 137 23 126 15 91) also that as the uterus becomes more profoundly influenced by estrin so does its reactivity to pitocin increase (121 149). It is further significant that estrin is ineffective when used *in vitro* (23 141). When administered *in vivo* it affects the activity of the myometrium only after a latent period of from eight to ten or more hours; contractions may not become maximal until a considerable time thereafter (137). These latter observations indicate that pure estrin has no specific contractile effect upon the myometrium but rather that (a) it must itself be altered by the organism before it may be utilized properly, (b) it affects other constituents in the body in such a manner that they in turn may cause or allow the uterus to become active, or (c) it so affects the permeability of the myometrial cells that they become reactive to normally circulating substances which are capable of stimulating them.

The effects of potent estrogens upon the course of pregnancy may be disposed of briefly by indicating that by varying of the dosage and time of administration either failure of implantation (35) premature labor (34 166) or post mature labor (79) may be obtained or there may be no significant effect. In those instances in which failure of implantation was observed the result was due apparently to the production of an endometrium which was unsuitable for nidation. The production of premature labor appears to be the result of the ability of estrin to augment uterine activity and reactivity. The inhibition of parturition by the administration of estrogenic hormone is attributed by Heckel and Allen (9) to the maintenance of the corpus luteum in a functional state as the result of this treatment.

There are numerous reports to the effect that although elevated throughout pregnancy the estrin levels reach their highest peak at the time of the onset of labor (23 189 31 28 135). Furthermore labor is preceded by a sudden increase in the excretion of the more potent

forms of estrin (167 165, 130). A similar increase was found to occur prematurely, directly prior to a spontaneous abortion (130). These levels are sufficiently consistent with changes in uterine motility that a postulation of causal relationship has seemed justified (140 88 86).

The effects of the progestational hormones are almost diametrically opposed to those of estrin. Briefly progestin causes the formation of an endometrium which is favorable for the inception and maintenance of pregnancy (33) inhibits rhythmic, estral contractions of the uterus (122 95, 145 138 143 148 179 54, 7), and reduces annuls or reverses the uterine response to pitocin (7 107). Adequate doses of estrin however, can overcome the inhibitory effects of physiological amounts of progestin (158).

It has been demonstrated (94 93 144 150) that the uterus responds well to pitocin during the estral phase but during pseudopregnancy and early pregnancy it is refractory. As pregnancy proceeds toward term the myometrium becomes increasingly responsive at the close of gestation an extreme sensitivity is noted (This is to be correlated with the estrin levels mentioned before). Allen and his associates (7, 107) have shown that the uterus may be rendered non responsive by the administration of crystalline progesterone but when a small amount of estrin is added as well the uterus may actually relax to pitocin treatment. These workers have adequately demonstrated that the myometrial response to progesterone is enhanced by the addition of a small amount of estrin. This is especially significant in view of the isolation of appreciable amounts of estrin from normal corpora lutea (10 4 5).

The effect of progestin upon pregnancy appears to depend upon the purity of the product administered. When impure products containing small amounts of estrin are used or when luteinization is induced near term by the administration of gonadotropic substances pregnancy may be prolonged (33 118 125 170 97) but when estrin free progestin or progesterone are given pregnancy is seldom protracted by even large doses (7) unless given at term (78) when the estrin titer is markedly increased.

Browne Henry and Venning (28) found the urinary concentration of sodium pregnandiol glucuronide regarded as an excretion product of progesterone to rise continuously up until the eighth month of pregnancy when the peak occurred. They noted a gradual fall thereafter, and the substance could not be demonstrated in the urine twenty four hours after delivery. The re-



sults of Wilson and Randall (188) differ somewhat from these, in that the urinary concentration was found to increase gradually up until term, when it dropped precipitously.

From these observations, it is apparent that the refractory state of the uterus early in pregnancy results from the influence of progesterin, and the increasing activity and reactivity which occur as term is approached are the result of estrin action. When a comparison of estrin and progesterin excretion levels is made, one is tempted to the conclusion that earlier in pregnancy the presence of estrin has as its primary effect the enhancement of the quieting influence of progesterin, and as the estrin curve rises, its full effect is felt.

### III THE ROLE OF THE PLACENTA

Evidence has accumulated to indicate that the placenta is in some species at least, the major source of the autacoids which have been shown to be responsible for the maintenance of pregnancy and, more than likely, the precipitation of labor. The data which substantiate this statement are based primarily upon (a) the isolation of these substances from the placenta (1 3 44 164, 49 115, 50, 68) (b) their presence in normal concentration in the blood and urine of women who have been castrated earlier in pregnancy (185 135), and (c) experiments which have demonstrated that the ovarian source of these hormones may, in certain species be removed without jeopardizing pregnancy.

Ablation of the gonads in pregnancy consists, in essence, of the removal of the corpus luteum. That this structure is essential for adequate implantation has been established (2). However the ovaries may be excised during gestation in some species without abnormal consequence [human (14, 65, 185 90 177, 83, 115) guinea pig (104, 105 80) mare (73) cat (36)]. The rabbit will generally miscarry if castrated before term (58, 8), whereas the goat, opossum, squirrel, mouse, rat and bitch will invariably miscarry after bilateral oophorectomy at any stage of gestation (2 92, 89).

The question arises as to why in some animals the corpus luteum is necessary until the close of gestation, while in others it frequently may be excised without danger to the pregnancy. The ingenious experiments of Newton (126) Brooksbey and Newton (26), Haterius (76) Seyle Collip and Thompson (162) Kirsch (92) and others clarify this question, and indicate that the fundamental differences in species response to gonadectomy are a function of the placenta and depend upon the

ability of this structure to serve either as an auxiliary to or a substitute for the ovaries. Its ability to do this undoubtedly depends, in turn, upon its capacity for the elaboration of progesterone (9).

It seems fitting to mention at this point the effect of ablation of the hypophysis during pregnancy. It is reported that hypophysectomy in the pregnant dog (13) and rabbit (56) is followed by the spontaneous termination of pregnancy. In the rabbit this is shown to be due to the regression of the function of the corpora lutea following the operation (144, 169). In this regard Robson (151) was able to maintain pregnancy for varying periods in hypophysectomized rabbits by causing luteinization or by administering progesterone. In the rat (131) removal of the entire hypophysis is followed by the resorption of embryos if the operation is performed before mid-gestation and prolongation of pregnancy and/or interference with the birth processes if done in the latter half of gestation. In this species no regressive changes are noted in the corpora. Ablation of the posterior lobe alone (the stalk being left in place) is reported not to alter the course of pregnancy (168). There is evidence to the effect that in the cat (6) guinea pig (132), and mouse (162) hypophysectomy does not interfere significantly with the normal course of gestation.

The work of Fisher, Magoun, and Ranson (57) rather definitely ascribes to the posterior lobe a function in the birth processes. In 7 pregnant cats the production of degeneration and atrophy of the posterior lobe of the hypophysis did not interfere with the duration of pregnancy or the onset of labor, but there was either partial or total inability to expel the contents of the uterus. Only 3 of the animals survived parturition; the remainder dying in the course of protracted labors. In interpreting these observations however it must be kept in mind that such animals have diabetes insipidus. Hence the disturbance of labor in them may be due to a derangement of the water and electrolyte balance of the body and uterine musculature rather than to an absence of the oxytocic principle of the posterior pituitary gland.

It is clear that considerable work must be done before a clear conception of the rôle of the hypophysis in pregnancy and labor may be obtained. However, it may be noted that in those species in which the corpora lutea are necessary for the proper course of gestation (dog, rabbit, rat), the hypophysis is likewise essential, conversely, in those forms in which gonadectomy does not interfere with pregnancy (cat, guinea pig), the

hypophysis may be removed without fear of abnormal consequences. The question then reverts to the placenta. It would seem that in animals in which the placenta is unable to manufacture sufficient progesterin for the maintenance of pregnancy it is also unable to elaborate sufficient gonadotropic substance for the preservation of the functional capacity of the corpora and the hypophysis must act as an auxiliary. This is not a serious objection to the hypothesis that it is the placenta which fundamentally determines the duration of pregnancy. It is more than likely that in the latter species the changes in placental activity at term are sufficient to create the hormonal imbalance necessary for the precipitation of labor. (This discussion brings to mind the so-called species differences which are the bane of endocrinological reviewers. It is quite possible that just as has been shown here these variations may be quantitative in most instances rather than qualitative.)

The role of the posterior lobe remains in doubt especially as the result of the work of Fisher *et al* and their implication that the hypophyseal stalk (which frequently remains *in situ* after hypophysectomy) is a functional portion of the posterior lobe. In Fisher's experiments however it is worthy of note that it was the birth processes themselves which were affected and not the timing or the onset of labor.

The suprarenal glands as possible etiological factors in the onset of labor have been adequately disposed of by the work of Allers *et al* (11). Thus it is difficult to avoid the conclusion that the placenta is the determining factor not only in the maintenance of gestation but also in the timing of parturition. Furthermore this is dependent upon the ability of the placenta to regulate estrin and progesterin levels. As Newton points out (127) however the demonstration of another potent extra-ovarian source of estrin the activity of which is markedly increased during pregnancy would definitely impair the case for the placenta. Since this has not been done one is left with the hypothesis that it is the placenta which is responsible for the phenomena which we have considered. [For more detailed discussions of the control of uterine motility placental autacoids and factors concerned in the duration of pregnancy the reader is referred to the reviews of Reynolds (141), Newton (127), Corner (32) and Snyder (171).]

#### IV THE EFFECT OF MINERAL IONS UPON THE MYOMETRIUM

Evidence has accumulated to indicate that uterine activity and reactivity are regulated not

alone by the estrogenic and progestational hormones but also and perhaps fundamentally, by the mineral ions. Recent reference to the effects of these autacoids upon mineral metabolism has added strength to the hypothesis that it is through alterations in the mineral balance that myometrial activity is fundamentally affected.

It has been pointed out repeatedly that uterine activity (19, 139, 40, 41, 39, 40) and reactivity (184, 40, 41, 159) are augmented by calcium ions and that a well contracting uterus may be rendered relatively or absolutely quiescent (184, 40, 41, 53, 23, 96) and its sensitivity reduced or annulled (184, 40, 41, 23) by relative calcium lack. The outward similarity of these artificially produced states to those which result from estrin and progesterin influence respectively, has been pointed out (40, 41).

It has been shown further that the absolute amounts of calcium in the circulating blood or in the nutrient fluid are of little importance provided they are adequate (184, 42). The salient feature is the amount of ionized calcium which in turn may depend upon many variables. For example it is well known that the ionization of calcium is profoundly affected by the concomitant concentrations of protein (116), citrate (52, 117), phosphate (21) or fixed base (20). In this latter respect a shift of the acid base balance of the blood toward the alkaline side causes a reduction of the ionic fraction without alteration of the total serum calcium value. It has been suggested (160) that the increased alkaline reserve may allow the proteins to combine with more of the calcium to form ionized compounds and thus introduce an added variable. With these facts in mind it should be apparent that the analyses of either sera or tissues for total calcium are not reliable criteria of the amount physiologically available for utilization. A similar conclusion likewise may be applicable to certain other blood and tissue constituents since their absolute amounts by no means reflect necessarily their effective concentrations.

Evans in his review of the physiology of plain muscle (52) states that it is best to consider calcium in its relation to potassium since there appears to be an ionic balance between the two the addition of one having generally the effect of withdrawal of the other. The experience of others (18, 69, 101, 75, 77, 113) and ourselves (42, 39) substantiates this statement notwithstanding reports to the contrary (156, 183). Furthermore we have found the absence of potassium to be just as potent a stimulus to the isolated uterus as the excess of calcium.

The effect of magnesium and sodium ions upon the uterus has received little attention. Van Dyke and Hastings (184) observed that the sensitivity of the guinea pig uterus immersed in a bath containing 10 millimol of magnesium per liter was depressed by either the addition or withdrawal of magnesium. We have found further (67) that spontaneous activity is depressed by magnesium, the duration of the depression being directly proportional to the amount of magnesium added. This corroborates the findings of Reynolds (139). Concerning sodium, the data is more unsatisfactory. In our experience with *in vitro* experiments the effect of sodium *per se* is nil, either increased or decreased amounts having no significant effect.

It seems justifiable to summarize these findings by constructing the tentative working relation

$$\frac{\text{Ca}^{++} + \text{H}^{+}}{\text{K}^{+} + \text{Mg}^{++} + \text{OH}^{-}}$$

upon which uterine motility might be thought to depend. An increase in the concentrations of either of the ions in the numerator would tend to enhance activity and reactivity, while an increase of those in the denominator would depress. If such a relationship is shown to be correct, then it becomes apparent that the uterus is dependent not upon any one ion for the state of its activity, but rather upon the relation of that one ion to the concentrations of at least four others.

#### V THE EFFECT OF THE FEMALE SEX HORMONES UPON THE MINERAL METABOLISM

Within recent years the effect of the female sex hormones upon mineral metabolism has received much attention. Although our knowledge of this interrelationship is incomplete, certain facts have emerged which undoubtedly have a direct bearing upon the question under discussion. One of the earliest references to this matter is that of Rossenbeck (155), who postulates, with little pertinent data, that the corpus luteum may effect such changes in the mineral ionic balance that finally, at the onset of labor the ionic concentration in the uterine muscle is optimum for its response to the stimulus of the posterior lobe of the hypophysis. Our present knowledge suggests certain alterations in this hypothesis; recent evidence however has tended to substantiate rather than refute its basic implication.

In regard to calcium, it should be emphasized again that estimations of total blood calcium give no indication of the concentration of active calcium in the circulation. Reports of declines of serum calcium in pregnancy (123, 55, 187, 29) rises,

(114), and declines with cyclic alterations in ovarian activity (114, 85), or rises (24, 163, 182), or declines after the menopause (108, 38), are all interesting, but unless marked changes are present the results give little insight into the true state of affairs. Studies of this sort may be complicated further by demonstrated blood volume changes at these times.

Reports of an increase in the blood calcium of pigeons, rats, doves, fowls, capons, and dogs after the administration of estrin (147, 146, 12) have been denied by some workers (103, 109, 110, 120, 84). Further, both osteoporosis (16) and hypercalcification of the skeleton (60) have been reported to follow such treatment.

In spite of these conflicting reports, certain observations have demonstrated unequivocally that calcium metabolism may be influenced profoundly by the female sex hormones. Since generalized tetany of the skeletal muscles must be attributed directly or indirectly to relative calcium lack, then the occurrence of this phenomenon as the result of estrin or progesterin influence would be strong evidence in favor of such an interrelationship. In this respect it has been demonstrated that in recently parathyroidectomized animals or in parathyroidectomized animals maintained on minimal amounts of parathormone, tetany may be regularly precipitated by the occurrence of estrus (106, 45, 46), or pregnancy (45, 46), or by the administration of anterior pituitary like substance from the anterior pituitary lobe estrin or progesterin (112). It thus appears as though both estrogenic and progestational hormones are capable of diminishing the available calcium. Although there is no evidence favoring such a view, it seems quite possible that in the one instance the lowered active calcium may result from utilization or fixation, whereas in the other the calcium may be rendered nonutilizable, or may be excreted. Blair Bell's finding (22) of a 50 per cent reduction in calcium excretion after castration in cats lends support to this explanation.

The interrelationship of the female sex hormones with sodium metabolism has been investigated only recently; however, sufficient evidence has warranted certain conclusions.

Among the earliest references to this subject is that of Rogoff and Stewart (153), who noted that the occurrence of estrus in dogs caused a marked prolongation of the survival time and the period of good health following adrenalectomy. This finding has been amply confirmed, and has been extended to show that artificially induced estrus and pseudopregnancy have a similar ameliorating effect (178, 63, 48). Furthermore, Swingle *et al*

(178) have shown that during the period of health the serum sodium levels remain within normal limits. The ameliorating effect of these states then is due obviously to the sodium retention which attends them and one must assume that it is the estrogenic and progestational hormones which cause this retention. This possibility has been investigated (181 71 72), and it has been found that progesterone estrone and estradiol all produce sodium retention which is manifested by a diminished excretion of this substance. However Swingle *et al* (178) state that with the possible exception of progesterone none of these substances may act as a cortical substitute. Gaunt and Hays (64) have now succeeded in maintaining life in adrenalectomized ferrets with progesterone alone and have found estrone to be markedly toxic for these animals; the same is true for rats (186). Moreover Gaunt (62) has raised the question as to whether the ameliorating effects of estrus in the dog are not in reality due to the ovulation and pseudopregnancy which closely follow this short period. In support of this contention he has shown that in the ferret estrus (which endures for a considerable period in this animal) will precipitate crises of cortico adrenal insufficiency in animals adrenalectomized and maintained on previously sustaining doses of cortical extract and salt.

Many of the fundamental features of this interrelationship have yet to be worked out, not the least important of which is the fate in each instance of the retained sodium, that is whether it may be found in the intracellular or extracellular spaces in the plasma or at the cell surfaces. At the present time any further analysis of this question would be pure conjecture and is beyond the scope of this review. However the implications are undoubtedly far reaching if obscure. In view of the marked and elective effect which these hormones have upon uterine contractility, it is not illogical to assume that the myometrial cells might likewise be profoundly affected as regards their sodium or fixed base balance. If this were true then the local concentration and availability of other essential ions might be influenced secondarily. That is the autacoids or hormones affect uterine irritability and contractility by affecting and regulating the ionic state of the uterine musculature.

#### VI. ALTERATIONS IN THE BLOOD VOLUME, BLOOD PROTEINS AND ACID-BASE BALANCE IN PREGNANCY

**Blood volume.** It is generally agreed that there is an increase in blood volume in pregnancy (172

119 174 161 43 129), which begins early in gestation (180) reaches its maximum at about the end of the eighth month (180), and declines toward normal thereafter (129 180, 99, 30). It is believed that the blood dilution is ascribable to retained water and that this factor may account at least in part for the weight increase in pregnancy which is out of proportion to the mass of the products of conception (26 61). This correlation with blood volume curves is also suggested by the reports of weight loss in the immediate prenatal period (82 190 163 37 51).

Thompson *et al* (180) suggest that these phenomena may have a hormonal basis since they have been observed to occur as early as the third week before there is any possibility of mechanical etiology. These authors also call attention to the fact that the blood volume starts to approach normal just at the time when the estrin curve is increasing.

**Blood protein.** A decrease in the total blood protein during pregnancy has been a constant finding. This decline has been shown to occur early in pregnancy and reach a maximum during the sixth month. There is a slight increase during the later months, a sharp rise during labor, a precipitous drop in the puerperium and the values return to a normal level from one to three weeks after delivery (133, 134). It has been suggested (176) that the lowered blood protein is the primary factor in conditioning the water retention of pregnancy. However, this explanation does not dispose of the fact that frequently the protein levels in pregnancy may not pass the bounds of normal. Furthermore in some instances there may be little correlation between the protein levels and the amount of water retention. It might seem more logical to ascribe the lowered protein to blood dilution (133) rather than the reverse and to agree with the view of Ivy and Gray (87) that the inorganic ion balance is perhaps of more fundamental importance.

**Acid base balance.** The carbon dioxide combining power of the blood is definitely decreased at term when it is approximately 45 volumes per cent as compared with 65 volumes per cent in non pregnant women (173). Stander (173) concludes that in pregnancy there is a compensated alkali deficit rather than a true or definite acidosis. The total serum base in pregnancy may be reduced as much as 5 per cent or more (175, 128). Harding and Allin (70) state that it has been demonstrated repeatedly that there is a reduction in the alkaline reserve which is demonstrable as early as the third month. Attention has been called to the unique ability of the pregnant organism to

tolerate a reduced concentration of serum electrolytes, and the paradox of lowered serum sodium levels in the face of an obviously developing water retention (128). The fact that in pregnancy an adequate plasma volume is maintained at lowered electrolyte levels calls to mind the ability of the adrenal cortical hormone to produce precisely the same set of circumstances (74).

#### SUMMARY AND CONCLUSIONS

This paper is presented not as a hypothesis, but rather as an attempt to correlate, for pedagogic and possibly for practical purposes, the available data at the present time which may bear upon the problem of the onset of labor. The minor or negligible influence of nervous mechanisms as primary causative factors has been pointed out. Although the precise mechanism by which the hormones act is unknown, it has been demonstrated that in all likelihood gestation is maintained by progesterone and labor precipitated by estrin. The essential role of the placenta in regulating the proper concentrations of these hormones has been stressed.

Calcium has been shown to be essential for uterine contraction. The similarity of the uterine response to progesterone and to calcium deprivation, and of the response to estrin and calcium in excess, has been pointed out. The acid base balance of the body is an important factor in the regulation of the availability of calcium, a relative alkali deficit favoring its activity.

There is evidence in support of the contention that the plasma alkali deficit and increased blood volume of pregnancy are dependent upon the interaction of the estrogenic and progestational hormones and are brought about through the ability of these autacoids to regulate the metabolism of sodium or fixed base. In spite of the fact that both groups of hormones produce sodium retention only one progesterone, is capable of acting as a cortical substitute. This seems to be direct evidence of the fact that the retention due to estrin influence is different from that due to progesterone. When one progresses further than this unstable ground is reached. However, it is not unlikely that through alterations in the metabolism of fixed base which have been shown to occur as the result of the influence of these substances the utilizable fractions of calcium and other essential ions might be altered secondarily and the motility response of the uterus so regulated. Such a hypothesis, though obviously incomplete might aid in the explanation of the delayed response of the myometrium to injections of estrin and progesterone, might point to certain

therapeutic measures which are more direct than the use of glandular extracts, and, further, might indicate a fundamental approach to the problem of the regulation of uterine contractility. Proof of these postulations must await a satisfactory method for the estimation of ionic calcium.

The precipitation of labor at term is not due to any one factor, but rather results from a combination of many. Among the factors which would contribute to so 'priming' the uterus are (a) the increasing estrin concentration in the face of apparently regressing progesterone levels, (b) the probable increase in active calcium, and (c) increasing distention which invariably produces gradually increasing contractions in any hollow viscus.

#### ADDENDUM

For more detailed consideration of certain of the subjects which have been reviewed here, the reader is referred to the current edition of "Sex and Internal Secretions" (191), and to Reynolds' book on "The Physiology of the Uterus" (192) both of which have appeared since this article was submitted for publication. Lack of space prevents an adequate consideration of many other recent and pertinent contributions to this rapidly fluctuating subject.

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# OBSTETRICS

## PREGNANCY AND ITS COMPLICATIONS

Brindeau A. Aseptic Necrobiosis of Fibromyomas in Pregnant Women (*La nécrobiose aseptique des fibromyomes chez la femme enceinte*). *Rev franç de gynéc et d'obst* 1939 34 193

Under the classification of aseptic necrosis or necrobiosis of uterine fibromyoma Brindeau includes not only red degeneration of fibromyomas in pregnant women but also necrosis with edema advancing in some instances to a pseudocystic formation. The pathogenesis of the two types is the same. The histological appearance varies according to the degree of the necrosis the necrotic areas may be scattered throughout the tumor with fairly normal areas between them or the necrosis may be almost complete and the muscular tissue almost completely destroyed. Often there is considerable edema of the muscular fibers which terminates in necrosis, and often there are interstitial hemorrhages.

Aseptic necrobiosis of uterine fibromyoma is of much more frequent occurrence in pregnant than in non pregnant women. Pregnancy is a definite factor in the production of this type of necrosis by causing ischemia of the tumor which is normally not extensively vascularized by displacement of the tumor and by dissociation of the smooth muscle fibers.

The most frequent symptoms of aseptic necrosis of fibromyoma during pregnancy are pain—which is not severe at first but may later be manifested in definite attacks with a peritoneal reaction—vomiting abdominal distention and constipation. The tumor is palpable and increases rapidly in size it is relatively soft in consistency sometimes almost fluctuating. Under treatment with rest and morphine, the crisis may subside in other cases there may be recurrences which necessitate surgical intervention.

Various complications may also make surgical intervention necessary. Infection of the tumor, although it may occur is fortunately rare during pregnancy if the tumor lies low in the uterus it may be infected by organisms from the vagina. Torsion of the pedicle occasionally complicates aseptic necrosis and hemorrhage into or around the tumor may be severe enough to cause symptoms. In case of spontaneous abortion the tumor may render expulsion of the fetus difficult and infection may result.

In case the crises of pain cannot be controlled by medical treatment or in case of such acute complications as torsion of the pedicle sudden growth in size of the tumor internal hemorrhage or infection surgical intervention is necessary. If the pregnancy is not at or near term myomectomy is indicated in 88 per cent of the cases in which this operation was done the pregnancy continued normally. If the pregnancy has advanced until the child is viable a low cesarean section may be done, followed by myomectomy or if necessary by hysterectomy. If the

tumor causes no serious symptoms until the time of labor, the woman may often be delivered spontaneously if the tumor does not cause dystocia. If the fibroma obstructs the os a low cesarean section is done at term or at the beginning of labor, followed by myomectomy or hysterectomy. If the woman is delivered normally, the presence of the tumor usually causes no complication in the puerperium if infection develops hysterectomy is indicated as a rule but in 1 of the author's cases a putrefied polyp was removed per vaginam in the puerperium. Among 59 cases of aseptic necrosis of fibromyoma in pregnancy in which operation was done there were 5 deaths myomectomy was done 41 times with 3 deaths, hysterectomy 18 times with 2 deaths.

Alice M. Meyers

## LABOR AND ITS COMPLICATIONS

Huber C. P. Dührssen's Incisions. *Am J Obst & Gynec* 1939 37 814

This review of 162 instances in which Dührssen's incisions of the cervix preceded delivery shows that the procedure is not without danger. It should be considered as a major obstetrical operation and should be done only in carefully considered circumstances in which the termination of labor becomes imperative in the interests of either mother or infant. It should not be postponed however until the condition of the patient and her baby increases the danger associated with its performance. Dührssen's incisions are not to be considered at the onset of labor as a method of facilitating the delivery. The following statements concerning their employment seem justified.

1. Dührssen's incisions are indicated in a limited group of cases in which the cervix is effaced but incompletely dilated.

2. In most instances indications for their use arise in the presence of prolonged labor with failure of cervical dilatation and the development of maternal exhaustion and uterine inertia.

3. The unrotated or incompletely rotated occiputoposterior position is a factor in the production of conditions indicating Dührssen's incisions.

4. Dührssen's incisions are indicated twice as frequently following the induction of labor as they are subsequent to the natural onset of labor. Induction of labor in the presence of a firm long undilated cervix is often dangerous from this standpoint.

5. The danger of hemorrhage subsequent to incision of the cervix is increased when difficult operative delivery is necessary. It is always a real danger as has been shown by a 26 per cent incidence of hemorrhages of more than 500 c.c. of blood.

6. There is less danger of extension or of cervical laceration when 3 cervical incisions are made than when 1 or 2 are made.

7 The morbidity of 27.2 per cent is high. Iofec tion should not be ignored even though there were no maternal deaths in this series.

8 The fetal mortality of 13.0 per cent is high but the review suggests that some fetal lives have been saved.

9 Subsequent obstetrical difficulty is not demonstrably increased by the performance of Deuchrsen's incisions.

EDWARD L. CORVELL, M.D.

### PUERPERIUM AND ITS COMPLICATIONS

**Lucchetti G.** A Contribution to the Study of Metabolism of Ascorbic Acid in the Puerperal State and in Gynecological Disorders (Contributo allo studio del metabolismo dell'acido ascorbico nello stato puerperale e nelle affezioni ginecologiche). *Riv. ital. di ginec.* 1939 22 141.

Lucchetti has used Rotter's cutaneous reaction for the estimation of the Vitamin C content of the organism in 205 women (this reaction is based on the fact that a 2,6-dichlorophenol-indophenol is discolored by the tissues at a speed depending on their content of Vitamin C). The approximate exactness offered by the method was thought to be sufficient for the purposes of this investigation which was conducted on subjects who took the average diet of the working class of Rome and could be divided into two groups: one of which received an average amount of Vitamin C and the other a large amount through the addition to the diet of such foods as fruits, salads and milk. The following conclusions were reached in the course of the investigation:

Non-pregnant women receiving the average diet which although not rich is not poor in Vitamin C had a tissue content of ascorbic acid sufficient for the needs of the organism. Consequently in those who received a large additional amount of Vitamin C a condition of saturation occurred which represented the optimum of tissue content of this vitamin.

In the puerperal state normal pregnant women under similar dietary conditions showed a decidedly lower tissue content of Vitamin C than that found in the controls. The Vitamin C contained in the average diets covered the requirements of their organism but may have been insufficient in some cases while the diet with additional amounts of the vitamin protected the woman against this eventuality. The tissue content of Vitamin C of the pregnant woman decreased proportionately to the exaggerated demands made by the pregnancy especially when the pregnancy was prolonged beyond term or when twins were involved. Women during labor showed a slightly higher Vitamin C content than normal pregnant women and than those who did not nurse their children; the latter presented values nearly equal to those found in normal pregnant women but with a tendency to acquire gradually the values of normal women as the puerperium advanced. Puerperal women who nursed their children had a lower tissue content of Vitamin C than all the other groups especially during the first

days of nursing. Thirty per cent of the women receiving the average diet and 4 per cent of those receiving additional amounts of the vitamin were in a state of hypovitaminosis. As the period of nursing advanced the tissue content of Vitamin C gradually approached the values for normal women.

In the most common complications of the puerperal state of toxic origin (hyperemesis, pruritus of pregnancy and eclampsia) with association of infections (puerperal fever and pyelitis) as well as in the prevalently hemorrhagic forms (late hemorrhage of the puerperium and hemorrhage due to post-partum atony) the Vitamin C content of the tissues was usually within normal limits. Hypovitaminosis was found in 16.6 per cent of patients presenting the various aspects of abortion.

In cases with gynecological disorders the Vitamin C content of the tissues was somewhat lower than normal in adnexal inflammations only and was generally normal even in the prevalently hemorrhagic forms of gynecological disturbances such as functional post-abortion and endometritic hemorrhages. In women with epithelioma the vitamin content was found to be somewhat higher than normal.

In some disease forms especially in hyperemesis in which no Vitamin C deficiency was demonstrated the administration of ascorbic acid has nevertheless been beneficial. It probably acts through a pharmacodynamic mechanism independent of its specific vitamin action.

RICHARDO KEMEL, M.D.

**Hansen R.** Post Partum Collapse (Der Geburtsschollaps). *Arch. f. Gynaek.* 1939 163 313.

The author presents an interesting classification and differentiation of the various types of post-partum collapse. He describes 6 different forms.

The anemic collapse which usually follows excessive hemorrhage is due to the blood loss which causes the peripheral organs to lose their ability to respond to the intact nerve impulses.

The purely nervous shock is characterized by severe nervous reflex vascular collapse. Goltz's experiment is regarded as a prototype. The nervous reflex collapse may occur during forceful Crede separation of the placenta.

In addition a mixed anemic nervous form of collapse is to be differentiated. It generally occurs in cases of uterine inversion, premature separation of the placenta and uterine rupture. In cases of this type the blood loss is combined with nervous reflexes which lead to partial dilatation of the vascular system and therefore to a pooling of the remaining blood.

Toxic collapse is primarily due to blood poisons which are important in eclampsia, puerperal toxemia and other septic conditions. The possible rôle of acetylcholine from the placenta as a factor in toxic collapse is suggested.

Other forms of collapse are the febrile collapse as well as the collapse due to diseases of the heart, lungs and thorax. The latter forms of collapse are

essentially the expression of the failure of the central circulatory apparatus, the heart, although a peripheral component may be present.

The different forms of collapse were accurately distinguished from one another with regard to their symptoms and therapy.

(GAETGENS) RONALD R. GREENE M.D.

Sheehan H. L. *The Pathology of Obstetrical Shock*. *J. Obst. & Gynaec. Brit. Emp.*, 1939 46 218

The criterion of obstetrical shock employed is wider than that in common clinical use. A patient is said to have had obstetrical shock if she died with the clinical appearances of shock during labor or within twenty-four hours after delivery, whether or not an explanation for the shock had been recognized before death. The material studied was restricted to those fatal cases of obstetrical shock in which post mortem examinations were performed in the Glasgow Maternity Hospital during the last five and one-half years. Fatal cases in which hemorrhage, the anesthetic or other such factors were the primary cause of death are excluded. Also excluded are sudden heart failures due to chronic valvular disease, circulatory collapse in certain cases of toxemia, acute pulmonary edema, and all cases in which death occurred in the first half of pregnancy.

The cases of obstetrical shock were grouped as follows:

Cause of shock	No. cases
1 Dystocia	29
2 Ruptured uterus	13
3 Retained placenta	22
4 Uteroplacental apoplexy	21
5 Uncomplicated cesarean section	4
6 Complicating disease	8

The clinical features of Groups 1 and 2 were similar. i.e. shock occurred during or shortly after labor because of hard operative delivery following a prolonged labor which was blocked for one of several reasons such as pelvic contraction or unfavorable position. A small number (6) of the uterine ruptures occurred spontaneously.

In Group 3, 6 patients died within from two to three hours after delivery. Hemorrhage was extreme in these cases and was probably of more significance than the shock. The remaining 16 patients in this group died from four to twenty-four hours after delivery, and the essential cause of death seemed to be shock, as hemorrhage was not a major feature. In 12 patients there had been frequently repeated but unsuccessful attempts to express the placenta. In 4 patients the placenta was expressed with a good deal of force (2 of these had inversion of the uterus).

The author believes that patients with uteroplacental apoplexy usually die of shock, not hemorrhage. Twelve patients were close to term and 9 had been pregnant between twenty-seven and thirty-three weeks. Nine patients died undelivered, most

of them had had many babies and were obese. In 3 cases, post partum hemorrhage was so severe that it probably was a significant factor in the cause of death.

The operations in Group 5 were performed on primiparas for contracted pelvis. One patient experienced a fairly severe hemorrhage, the others did not. Shock and death occurred in from two to five hours.

In the last group in which there were 5 spontaneous deliveries death followed clinically characteristic shock within eight hours. The diagnoses in these cases were varied: 4 patients had definite evidence of previous hypertension, the others had pneumonia, acute pancreatitis, renal disease, and influenza, respectively.

The pathological findings were as follows:

*Vascular system in general.* There was no obvious pooling of blood in the abdominal viscera, the muscles of the thigh, or in the large veins.

*The heart.* One of the most common findings in obstetrical shock was the presence of subendocardial hemorrhages on the left of the interventricular septum and occasionally at the base of the papillary muscles in the left ventricle. These hemorrhages were found in one-third of the cases, and were much more common in those cases in which shock had been present for six or more hours before death. Such lesions have been found rather more infrequently in the following conditions: general shock, lesions of the brain and vagus nerve (fractured skull, cerebral hemorrhage), purpuric diseases and hypertensive toxemia. A possible significance of these hemorrhages is their position over or among the fibers of the conducting system and their indication of an alteration in capillary permeability.

*Lungs.* There were no characteristic findings. In some cases the lungs were dry and anemic and in others they were congested and edematous. Petechial hemorrhages were found occasionally.

*Stomach.* Acute dilatation was a rather common feature in the cases of dystocia.

*Uterus.* The local uterine findings naturally depended upon the condition present. Rupture was an obvious lesion; the author believes that the hemorrhage in such cases was insufficient to account for death. In uteroplacental apoplexy the usual finding was multiple hemorrhagic lesions under the peritoneum and in the outer layers of the uterine muscle. In several of the cases of dystocia, necrosis of the uterine wall was found.

*Ovaries and pelvic floor.* These showed nothing characteristic.

*Pituitary gland.* There were no recognizable lesions in the hypophysis if the patient had died within from twelve to fourteen hours after delivery. If the patient had lived for several days and then died, necrosis of the anterior lobe was common. The author thinks that this might be significant.

*Brain and adrenals.* These organs presented no specific lesions.

DANIEL G. MORTON, M.D.

# GENITO-URINARY SURGERY

## ADRENAL KIDNEY AND URETER

**Bassi P** The Action of Staphylococcal Toxin on the Kidney Subjected to Interrupted Temporary Suspension of the Arterial and Venous Circulation (L'azione della tossina stafilococcica sul rene sottoposto ad interruzione temporanea della continua della circolazione arteriosa e venosa) *Ann Ital di chir* 1939 18 18

Bassi has shown in a previous study that the changes found in the functional cells of the kidney subjected to interrupted temporary suspension of the circulation are transitory and rapidly reversible. The aim of his present study was to determine the effect of intravenous injections of staphylococcal toxin on the kidney treated in the same manner. Therefore he used a diluted twenty four hour culture of hemolytic staphylococcus aureus on agar 1 cm of which he injected every twenty four hours for a varying number of times into the marginal vein of the ears of rabbits of an average weight of 2 kgm after the rabbits had been subjected to 6 periods of five minutes each of interruption of the circulation of the left kidney at intervals of one minute. The rabbits were killed after twenty four hours, four days and six days to serve as controls 3 rabbits in which only the toxin was injected were killed after the same lapses of time.

The experiments confirmed the results obtained by other authors there were severe vascular and parenchymatous changes. However an interesting observation was made in the animals killed after twenty four hours which had received only one injection of toxin the right kidney was normal in 3 of the 5 rabbits used and showed some degree of hyperfunction while there were very moderate intertubular cortical hemorrhages in the 2 other animals. The left kidneys of the 5 rabbits presented already evident histological changes in the parenchyma and the vessels decidedly more intense in the former than in the latter. These changes were undoubtedly related to the action of the toxin as the temporary interruption of the circulation had never caused such severe changes in either of the elements. However this interruption acted unfavorably on the kidney by causing alterations in the cells of the tubules which became less resistant to the toxin.

In the rabbits killed four days after the first injection the parenchymatous and especially the vascular changes were more severe there were necrotic zones and great extension of the altered zones in the parenchyma and degenerative lesions of the glomeruli and vessel which were not at all in evidence in the first group of animals.

After six days there were zones of necrosis surrounded by leucocyte infiltration and around these vascular thrombosis indicating the pathogenesis of their formation. However these findings did not

apply to every case as even cortical necrotic foci were observed in various forms as well as deeply altered and thrombosed vessels in zone in which there were only degenerative lesions of the tubular epithelium. It is probably more correct to consider that the toxin acts directly on the cells of the tubule as well as on the vessels and causes phenomena of degeneration or necrosis in the first and degeneration of the walls and thrombosis in the second. This would explain the initial intertubular hemorrhages through alteration of the capillaries to which the experimental disturbance of the circulation may have contributed. The absence at this time of glomerular changes suggests that these vessels are more resistant to the action of the toxin than the capillaries of the tubules. **RICHARD KEMEL, M.D.**

**Kallfjer R** The So called Spontaneous Perirenal Hematoma (Ueber das sogenannte perirenale Hæmatom) *Uppsala Lakaref Förh* 1939 44 233

The author presents a review of the various causes of spontaneous perirenal hematoma, based in part upon his own observations.

In all perirenal hematomas originating in the kidney itself either reduced coagulability of the blood or gross changes in the renal vessels usually the arteries are present. That the hemorrhages are not due to diapedesis is shown according to the author by the circumstance that the perirenal hemorrhages of infarcts occur almost exclusively in septic infarcts in which there is the greatest possibility of an immediate lesion of the small sized and medium sized arteries. In some cases of course the renal origin of the hemorrhage is not demonstrable. It is possible, moreover that smaller aneurysms or other gross changes may have been overlooked. Probably also vasomotor disturbances may be responsible for the hemorrhages. In the discussion of the diagnosis the author points to the importance of the triad of phenomena established by Wunderlich namely, pains increasing fullness of the kidney region and signs of internal hemorrhage. It is important and therapeutically advantageous to make an exact diagnosis of the cause of hemorrhage not only in general but also in the individual case. To this end the author gives some directions with regard to the roentgenogram.

Without operation the prognosis of perirenal hematomas is considered unfavorable. The mortality is estimated between 40 and 60 per cent. However with or without operation the prognosis depends in great measure upon the actual cause of the development of the hematoma. According to Barthel's cases which develop slowly without acute symptoms appear to be more favorable prognostically. Adrenal hemorrhages and those associated with hemophilia terminated fatally almost without exception.

Finally, in conjunction with a personal observation presented in detail some cases from the literature are described which show that perirenal hematomas occurring in connection with septic infarcts usually develop in the course of acute infection run a febrile course and present such characteristic features that they constitute a distinct uniform type of disease, recognizable in typical cases (HEINEMANN GRUEBER) J M SALMON M D

Campbell M F Ureteral Obstruction in Children  
J Urol 1939 41 660

Among 12 080 autopsies in children congenital stricture was found in 0.6 per cent. Ureteral obstruction may be acquired during early life. In persistent urinary infection in children (so called chronic pyelitis) ureteral blockage is demonstrable as the principal factor most often. Congenital ureteral obstructions in the young include stricture reduplication aberrant vessels kinks folds diverticulum torsion ureterocele blind ureteral ending abnormal ureteral insertion including ectopy and cyst. Acquired ureteral obstructions include traumatic and inflammatory stricture stone tumor and extra ureteral pressure from tumors cysts enlarged lymph glands and adhesions in one case ureteral gumma caused obstruction.

The pathological changes in the urinary tract proximal and consequent to the obstruction are often asymptomatic even though pronounced. If the obstruction is unrelieved by diuretic therapy stricture results and when infection sets in irreparable renal injury is common and demands nephrectomy. The etiological relationship of ureteral obstruction to renal calculus is the same as in adults. Usually the urological investigation is prompted by persistent urinary infection (so called chronic pyelitis of childhood). Successful methenamine chemotherapy at once suggests the absence of urinary stasis. Persistent pyuria is the most common objective symptom. The pyuria may be found accidentally but usually follows a previously acute infection (pyelitis). The common story is that of recurrent attacks of pyelitis, usually coincident with focal infection elsewhere, especially in the tonsils or adenoids rhinitis laryngitis and dental infection or acute intestinal disturbances. In the absence of infection advanced renal damage from obstruction may give the clinical and laboratory picture of chronic interstitial nephritis. In advanced bilateral hydronephrosis the late renal pathology may be that of nephrosclerosis (renal rickets). The only subjective symptom is pain in the loin. Diet crisis or the typical stone colic are less common. Hematuria often results from hydronephrotic distention but may be due to stone mobilization. Gastrointestinal disturbances are notable in at least one fourth of the cases and may be produced reflexly with unilateral obstruction. With bilateral obstruction and advanced renal injury there may be urinary toxemia with anorexia constipation loss of weight or failure to gain malaise and increasing debility.

Fever is usually low, with fresh infection or acute exacerbation of a smouldering infection from obstruction, the picture is that of persistent acute pyelitis and requires free urinary drainage or nephrectomy. With advanced renal injury, uremia is evidenced by headache, hyperirritability, mental lassitude, later stupor, and death.

The diagnosis is often suggested by persistent or recurrent pain along the upper urinary tract. Excretory urography often satisfactorily demonstrates the obstruction but is of no help when renal function is diminished. The anatomical diagnosis can usually be made by retrograde ureterography. Urological investigation should be done in any child in whom persistent pyuria resists intense medical therapy for from four to six weeks. Sterilization of the urine by mandelic acid and sulfamamide in chronic pyelitis should not exempt the child from excretory urography, for the persistent infection suggests the presence of urinary stasis. A complete urological study is also indicated for persistent frequency, urgency difficulty or other urinary disturbances, hematuria not due to glomerulonephritis for tumor or pain along the course of the urinary tract and especially in cases of persistent hyperacute renal infection.

The fundamentals of treatment are (1) the establishment of free urinary drainage with eventual eradication of the obstruction and (2) bacteriological cure of complicating infection. The prognosis therefore depends on the degree of renal damage by urinary back pressure and infection.

Ureteral stricture is congenital about once in every 150 children. Most of these strictures are simply exaggerations of normal ureteral narrowings. Fibrosis may be present even without infection. Two thirds of the congenital strictures are at the ureterovesical junction, nearly a third at the uretero-pelvic junction and the remainder in the body of the ureter. When ureteral obstruction is high the renal damage is likely to be more extensive. With low blockage the adjacent proximal ureter shows the earliest dilatation. In the diagnosis of ureteral stricture instrumental exploration and urography are indicated. Grasping of a No. 4 F catheter is presumptive evidence of stricture and ureterography will demonstrate ureteral dilatation above the narrowing. In older children bulbous bougies of larger caliber may be used but one must not be confused by the normal ureteral narrowings in the lower ureter or by localized ureteral narrowing. Uretero-spasm seldom produces the same picture on all films on the same or on different days unless a local provocative lesion exists.

The treatment of congenital ureteral stricture may be (1) conservative (a) instrumental or (b) surgical or (2) radically surgical. Conservative instrumental treatment means periodic progressive dilatation with bougies. Strictures of the upper ureter seldom respond to this treatment. The author has devised a 17 F cysto-urethroscope which accommodates bougies including 10 F for this pur-

pose. Dilatation to 6 or 7 F usually suffices for infants but children of three or four years should be dilated to 10 F. Treatment may also be carried out by passage side by side of 2, 3 or 4 No. 4 catheters through a regular miniature cystoscope. Usually early dilatations are done at intervals of from ten to fourteen days and dilatations should be continued until the stricture remains dilated.

Conservative surgical treatment of ureteral stricture is concerned chiefly with cystoscopic ureteral meatotomy in ureterovesical junction stricture. If this fails the stricture is divided through the opened bladder.

Most strictures of the body of the ureter can be treated by cystoscopic dilatation. If this is not possible nephrectomy is indicated more often than a plastic operation. Apparent stricture from extra-ureteral pressure may be treated by ureterolysis. Stricture of the pelvic outlet rarely responds to cystoscopic dilatation. The author has had poor results from ureteropelvicoplasty. The eradication of obstruction by aberrant vessels or fibrous bands often gives good drainage. Advanced cases may require nephrectomy.

Ureteral injuries following trauma to the loin with resulting stricture is possible. A traumatic stricture may result from careless or unwise ureteral dilatation. Traumatic ureteral stricture is extremely resistant to dilatation and nephrectomy may be necessary. Excision of the stricture with end to end anastomosis is not recommended because of the small caliber of the ureter and the possibility of the reformation of a denser stricture. Preliminary nephrostomy or ureterostomy for drainage aids determination of the renal capacity if the kidney proves a useless nephrectomy is indicated.

A ureterocele may be observed cystoscopically. In girls it may protrude through the urethra. The author has observed 33 cases, bilateral in 7. The pathology, symptoms, diagnosis and treatment are the same as for ureterovesical junction stricture. The tight meatus is the important lesion. The various methods of treatment include (1) division by a cystoscopic electrode, (2) cystoscopic dilatation by a large bougie, (3) suprapubic excision and running suture about the base of the ureterocele. Advanced ureteral and pelvic dilatation and infection may demand ureteronephrectomy.

Ureteral reduplication is complete in a fourth of the cases. When the stricture does not respond to conservative dilatation ureteroheminephrectomy with removal of the obstructed ureter is indicated.

Ureteral links are more often consequent to peripheral obstruction than to congenital malformation. They are often observed secondary to lower urinary tract obstruction. Secondary penureteritis may firmly bind down a secondary link and require surgical mobilization. In links secondary to ureteral obstruction ureteral dilatation usually diminishes or eliminates the angulation.

Ureteral valves rarely cause obstruction. They are observed in late fetal and neonatal life in about

20 per cent of the bodies but usually disappear during the first six months after birth. The author has found it post mortem in a boy aged seventeen. The treatment is that of the secondary pathology.

A diverticulum of the ureter rarely causes obstruction. The author saw one in a girl aged four. The sac may form primarily as an accessory ureteral bud or secondarily as a blow out consequent to distal ureteral blockage. It may compress the ureter with proximal dilatation or perpetuate an established urinary infection ('chronic pyelitis'). Such sacs are demonstrable by ureterography and are best excised.

Torsion of the ureter occurred twice in 12080 autopsies in children. It results from failure of the ureter to rotate with the kidney. Twisting of the duct produces obstruction. There is no record of its identification in the living.

Abnormal insertion of the ureter high in the renal pelvis produces a 'spur valve' blockage. It may result from renal rotation downward and inward and from hydronephrosis.

Ectopic ureteral orifices are more often abnormally dilated than constricted. When constricted the treatment is that of a ureterovesical junction stricture. Often ureteronephrectomy or ureteroheminephrectomy is necessary.

Extra-ureteral pressure from aberrant vessels, tumors, cysts, enlarged lymph glands and adhesions must be treated according to the local pathology. In about half the cases of vascular blockage division of the obstructing vessels suffices.

Ureteral stone in children usually manifests the same symptoms as in adults. So-called intestinal colics are often ureteral colics. The stones are often radiopaque (composed of uric acid) and are demonstrable as negative shadows. Ureteral dilatation encourages the passage of small stones. With an impassable stone or with infection and advanced upper tract dilatation ureterotomy is indicated unless advanced disease demands nephrectomy.

Inasmuch as infection is the most important complication the instrumental treatment should be supplemented by vigorous chemotherapy. The author's first choice is ammonium mandelate together with ammonium chloride to insure adequate acidity. Instrumentation is preceded by antiseptic treatment for from three to six days. The second choice is sulfanilamide. No patient is pronounced cured of infection until 2 sterile cultures of aseptically collected urine have been obtained.

LOUIS NEUWELT, M.D.

Rudnick, D. F. and Cornell, E. F. Clinical Manifestations of Stricture of the Ureter in Women. *J. Urol.* 1939, 41: 679.

Thirty eight cases of ureteral pain in which stricture of the ureter was demonstrated in 34 and ureteritis in 31 are reported by the authors. The symptoms of abdominal or lumbar pain or discomfort are frequently periodic and are often associated with menstruation. Vesical symptoms were not prominent.

The authors claim that the diagnosis is suspected on finding ureteral tenderness during vaginal palpation and confirmed by cystoscopic and urographic examination. Dilatation of the stricture to No 10 F is advocated by the authors, and it was found that one dilatation was sufficient in 75 per cent of their cases.

D E MURRAY M D

### BLADDER URETHRA, AND PENIS

Bailey H Reconstruction of the Deep Urethra  
*Brit J Urol* 1939 11 111

When a complete intrapelvic rupture of the urethra occurs in addition to a fractured pelvis and avulsion of the membranous from the prostatic urethra the puboprostatic ligaments are torn which permits the unanchored bladder neck to rotate backward. This is aided by the dorsal decubitus plus the accumulation of blood and extravasated urine in the space of Retzius. Unless properly treated a hopeless stricture is formed.

The author reports the case of a boy nineteen years of age who had sustained a fractured pelvis complicated by an intrapelvic rupture of the urethra. Because of several other injuries all that could be done at once was a suprapubic cystostomy. Seven weeks later the diagnosis was verified by the cystogram and this showed a gap of an inch between the severed ends of the urethra.

An incision was made in the perineum. Beneath the pubic arch a considerable amount of callus was encountered and this was picked away. A sound was introduced into the suprapubic sinus to assist in the location of the apex of the prostate. A gum elastic catheter was then passed from the external urinary meatus through the urethra and out through the proximal portion of the urethra. The bulb of the corpus spongiosum was dissected from the corpora cavernosa. The flaps hung toward the free end were then cut from the floor of the urethra. These flaps contained the whole thickness of the bulb. The right flap was sutured to the roof of the free end of the prostatic urethra and the left flap was similarly fixed partly overlapping the first. No attempt was made to close the floor. The wound was packed lightly with gauze soaked in flavine. A de Pezzer catheter was placed in the suprapubic wound.

On the twelfth day under gas anesthesia a No 10-12 Lister sound was passed from the meatus into the bladder. The tip of the metal sound had been drilled and via the drill hole a piece of silk was insinuated along the whole course of the urethra. By means of the silk a catheter was introduced from the bladder to the meatus and it was subsequently changed by the railroad method. The perineal wound took weeks to heal.

At the present time one year after the accident the patient who has had complete loss of the compressor urethra has no control and is obliged to wear a portable urinal. Later an attempt will be

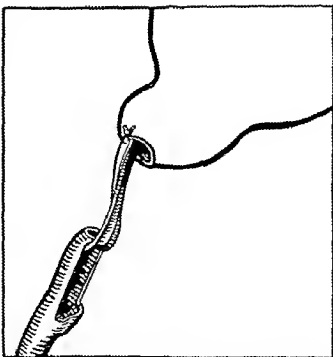


Fig 1 A similar flap is cut from the left side of the floor and the free extremity of each is sutured to the apex of the prostate slightly overlapping one another.

made to construct a sphincter by means of a graft of the gracilis muscle. The patient is obliged to wear a urinal although he is well and active with complete healing of the suprapubic wound.

ELLIER HESS M D

### GENITAL ORGANS

Bluemel The Results of Transurethral Resections of the Prostate in Prostatic Hypertrophy (Die Ergebnisse der transurethralen Prostataresektionen bei Prostatahypertrophie) *Zentralbl f Chir* 1938 p 2683

Among 214 patients with prostatic disease there were found 164 with benign hypertrophies of which 65 were treated by suprapubic prostatectomy, 59 by transurethral resection and 40 were treated conservatively. The contraindication to suprapubic prostatectomy constituted the indication for transurethral resection. This method was used therefore from the beginning only in the more unfavorable cases. Of the patients so treated 10 died in the hospital after a more or less prolonged time and the death of 4 of these with certainty cannot be attributed to the operation. Of the 6 others 2 died from an injury of the membranous portion of the urethra and 4 showed phlegmons of the bladder wall with pyelonephritis. The function of the bladder was good on dismissal from the hospital in the other patients operated upon.

Information was obtainable later from 47 patients 11 had died and of 12 who gave information in writing 1 complained of cystitis 1 catheterized

himself and the others were free from symptoms. Twenty seven patients could be followed up and had more or fewer symptoms.

In view of the fact that operation was carried out only in patients who would otherwise have had to be catheterized permanently or on whom a bladder fistula would have had to be made the result must be considered as satisfactory.

(VON TAPPEINER) LOUIS NEURELT MD

Belt E Ebert C E and Surber A C Jr A New Anatomical Approach in Perineal Prostatectomy *J Urol* 1919 41 482

The authors present a technique for perineal prostatectomy with illustrations and general operative results.

A curving transverse perineal incision  $1\frac{1}{2}$  cm from the anal mucosa exposes the delicate fibers of the median raphe. These are cut and the arching fibers of the external rectal sphincter are revealed. These are raised to dislocate the longitudinal muscle layer of the rectum. The anal canal and rectum are depressed and pushed backward to define the central tendinous plane of the perineum. The areolar tissue and tendinous portion of the recto urethralis muscle joining the rectum to the base of the perineal membrane are snipped through which reveals the anterior free borders of the levatores ani and the flat sheath of the recto urethralis. The recto urethralis is split medially and retracted laterally with the levatores ani which exposes the tough white shining fascia of Denonvilliers covering the posterior surface of the prostatic capsule. By use of the cleavage plane present between the external sphincter ani and the longitudinal muscle fibers of the rectum therefore

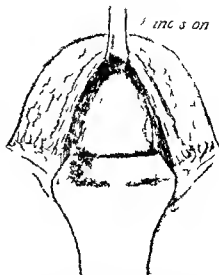


Fig 2 Levator ani muscles pushed laterally rectum pushed backward. Posterior surface of prostate exposed. Dotted line marks incision through capsule.

the capsule of the prostate is exposed bloodlessly and without section of a nerve.

SIMON J RITTER MD

Wessel E The Results of Operative Therapy in Cryptorchids (Ergebnisse operativ behandelte Kryptorchiden) *Deutsche Zeitschr f Chir* 1938 251 235

The newer conceptions of the genesis and hormonal relationships of cryptorchidism have crowded somewhat into the background the purely technical aspect of its surgery. It is now generally accepted that it is expedient to classify patients with this condition into two distinct groups: those afflicted with purely anatomical anomalies such as failure of testicular descent owing to distortions or adhesions and those in whom endocrine abnormalities are readily demonstrable. The bilateral cases very definitely belong to the second group without a doubt. Endocrine therapy alone will bring about the descent of the testes. Perfect results are reported following this treatment by reliable observers. The grafting of hypophyseal tissue also appears to be successful.

The indication for operative procedures consequently depends upon the group in which the patient belongs. The best period for operation is between the ages of eight and eleven years. A bilateral operation should be undertaken only when an endocrine disturbance is ruled out. In other cases hormonal treatment should be instituted and only after it has failed should an operation be performed. Careful consideration should be accorded the advice to treat the children who have been operated upon with hormonal methods following the operation.

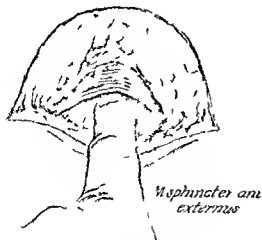


Fig 1 Finger in cleavage plane between external sphincter ani muscle and rectum.



The author conducted a follow up examination of 56 cryptorchids operated upon in the Sauerbruch Clinic in the last ten years. This was done, not only for checking the position of the replaced testes but also to note their size and the developmental proportions of the entire body. The detailed results, which are partially tabulated should be read in the author's original paper. Nothing could be definitely asserted in this series of cases regarding the generative powers of the organ; the patients should be subjected to further observation relative to this question. In nearly all of the patients the operation promoted the growth of the testes and because of that development the growth of the entire body was improved. (ROEDELUS) MATTHIAS J. SEWERT, M.D.

**Imbert M.** Rapid Cure of Acute Orch. Epididymitis by Injection of Novocaine into the Vas Deferens. (*Guerison rapide des orch. epididymites aigues par des injections differentielles de novocaine*). *J. d'urolog. med. et chir.* 1939 47 177

In orch. epididymitis resulting from gonorrhea or other infection Imbert has found that pain is often severe and is not relieved by the usual methods of treatment. In orchitis and orch. epididymitis there is an active inflammatory process and the condition is not unlike that observed in sprains. In the latter Lerche has advocated the local infiltration of novocaine. The author therefore determined to use a similar method of local nerve blocking of the nerve terminations in the region of the vas deferens. The arteries of the testicle, the epididymis, and the vas deferens are richly supplied with sympathetic nerve plexus and when novocaine is injected the sympathetic reflexes and the resulting vasomotor reactions are interrupted. A long fine needle is used and a 1/100 solution of novocaine from 10 to 15 cm. of this solution are injected. As a rule a single injection is sufficient to relieve the pain; if not the injection may be repeated on the following day.

The author has treated 15 cases of acute orch. epididymitis due to gonorrheal infection, 1 of these with bilateral involvement by novocaine infiltration. The pain was entirely relieved in an average of thirty hours; the inflammation subsided in an average of fourteen days. In 1 case of orch. epididymitis due to colon bacillus infection pain was relieved in three days; recovery was complete in twenty days but in this case there was a septicemia which delayed recovery. In 7 cases of orch. epididymitis due to various types of urinary tract infection (1 with bilateral involvement) the pain subsided in an average of twenty hours and the inflammation was relieved in an average of three days and four hours.

In all cases of orch. epididymitis, the primary infection should be treated as usual; the author has found vaccine treatment of value in gonorrheal infections. The chief effect of the novocaine infiltration is to relieve the pain; it also relieves the swelling, edema and inflammation of the tissues and shortens the period of hospitalization.

ALICE M. MEYERS

## MISCELLANEOUS

**Thomson D. L.** The Relations Between Endocrinology and Urology. *J. Urol.* 1939 41 435

The author does not attempt to cover all of the topics which the title suggests.

The growth of the prostate, normal or abnormal, depends on the prostate being constantly irrigated with blood containing the testicular hormone. It seems logical that when involution is desired it can be achieved by castration. At one time this heroic measure enjoyed a certain vogue but in this generation less drastic measures are used. The most obvious of these is the administration of female sex hormones (estrogenic substances).

The hormones characteristic of the male and female sexes are extremely similar substances, the two most important physiologically (estradiol and testosterone) differ only by 1 carbon and 6 hydrogen atoms. Every individual whether male or female possesses both estrogenic and androgenic hormones though sex may determine which predominates. Nevertheless though we no longer think of the male and female hormones as actively antagonistic or incompatible it might theoretically be possible to inhibit the growth of the prostate by administering estrin (theelin) for this will curb the activity of the anterior pituitary gland and the lack of its stimulus will depress testicular function; therefore the development of the prostate will be retarded. On the other hand most endocrinologists regard estrogenic substances not as a possible means of cure but rather as a probable cause of prostatic hypertrophy and reference is made to the studies in animals with the estrin treatment. There are however objections to the view that estrogenic substances are the cause of prostatic hypertrophy. It is not certain that the estrogenic substances occurring in the male body are the ones used by these experimenters and many of these workers were unable to find evidence of unusual quantities of estrin in sufferers from prostatic enlargement although biological assay is uncertain in these determinations. The author states that it will be extremely difficult either to prove or to disprove the hypothesis that estrogenic substances cause so called spontaneous hypertrophy of the prostate.

On the other hand other experimenters in the hope of reestablishing the endocrine balance of youth have treated prostatism with testosterone propionate (the most potent androgen available). They believe that just as estrogens have a general tendency to produce squamous metaplasia, so androgens have a tendency (well seen in the reaction of the capon's comb, the standard test object for these hormones) to produce a mucoid edema. This they regard as characteristic of the healthy prostate and as a preventative of spasm of the urethral sphincter, for they believe that spasm rather than passive obstruction is the cause of dysuria and retention. Similar ideas underlie the proposal to treat prostatism by the Steinach operation of ligation of the vasa efferentia between the testes and the epididymides,

himself and the others were free from symptoms. Twenty seven patients could be followed up and had more or fewer symptoms.

In view of the fact that operation was carried out only in patients who would otherwise have had to be catheterized permanently or on whom a bladder fistula would have had to be made the result must be considered as satisfactory.

(Von TAPPEINER) LOUIS NEUWERT M D

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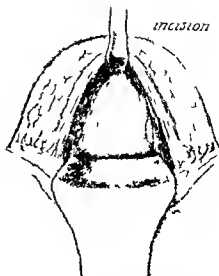


Fig 2 Levator ani muscles pushed laterally rectum eased backward. Posterior surface of prostate exposed. Dotted line marks incision through capsule.

the capsule of the prostate is exposed bloodlessly and without section of a nerve.

SIDNEY J RITTER M B

Wessel E The Results of Operative Therapy in Cryptorchids (Ergebnisse operativ behandelte Kryptorchiden) *Deutsche Zeitschr f Chir* 1938 251: 235

The newer conceptions of the genesis and hormonal relationships of cryptorchidism have crowded somewhat into the background the purely technical aspect of its surgery. It is now generally accepted that it is expedient to classify patients with this condition into two distinct groups: those afflicted with purely anatomical anomalies such as failure of testicular descent owing to distortions or adhesions and those in whom endocrine abnormalities are readily demonstrable. The bilateral cases very definitely belong to the second group without a doubt. Endocrine therapy alone will bring about the descent of the testes. Perfect results are reported following this treatment by reliable observers. The grafting of hypophyseal tissue also appears to be successful.

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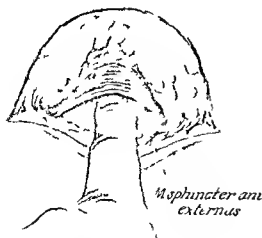


Fig 1 Finger in cleavage plane between external sphincter ani muscle and rectum.

they could follow the activity of the dogs' kidney without anesthesia, from minute to minute and they found that exercise and alarm or anger caused a prompt cessation and gradual resumption of the secretion of the urine. The curve of response was unaffected by denervation of the kidneys or inactivation of the adrenals and was exactly the same as the curve obtained when extracts of the posterior pituitary lobe are injected. It would be interesting to make similar experiments on hypophysectomized dogs though it is difficult to remove the whole posterior lobe in this species. It seems that the activity of the posterior lobe in governing the kidney can itself be controlled through nervous stimuli and probably also through chemical stimuli. It has previously been suggested that a hyperactive posterior pituitary lobe produces the symptoms of eclampsia but the evidence on which this theory is based has been subjected to very destructive criticism. It does not seem probable that the posterior lobe could long maintain an elevated blood pressure in human beings without other symptoms dominating the picture and the nearest experimental approach to hypertension as it is seen in the clinic is along quite different lines. These lines however are of considerable and direct interest to urologists: the experiments of renal hypertension referred to are those of Goldblatt, Lynch, Hanzal and Summerville. These workers showed in the dog that if the blood supply to the kidneys is reduced by the application of constrictive clamps to the renal arteries there follows a rise in the blood pressure which may be maintained for months or even years. The result of applying this treatment to one kidney when the other is removed is the same yet in neither case is it necessary or even usual that excretory function be seriously impaired. It is thus possible at will to produce either a chronic or a malignant hypertension.

One would be tempted to interpret the rise of blood pressure following renal ischemia as an attempt to maintain normal blood flow through the kidneys in spite of the obstruction and to regard the phenomenon as a reflex. However, it has been shown that denervation of the kidneys does not interfere with the response. If the nervous system is not involved one must search for a humoral agent as the cause of the increased blood pressure but there is no evidence of increased adrenaline secretion and inactivation of the adrenal medulla has been found to have no effect.

So many possibilities are excluded by the work outlined that only one plausible theory remains that the ischemic kidney itself produces a pressor substance that it elevates the blood pressure without diminishing the blood flow through the peripheral tissues or causing a fall of the skin temperature and thus reproduces the conditions actually observed in typical clinical hypertension. There is evidence that unusually large quantities of this pressor substance are found in the ischemic kidneys of dogs subjected to Goldblatt's procedure and in

the kidneys of human subjects with hypertension. It is still impossible to say to what extent clinical hypertension is due to this newly discovered mechanism (as it is also impossible to say why ischemia provokes the kidney to the continuous production of the pressor substance) however, the demonstration that the kidney may be the primary origin of the factor responsible for hypertension must vividly stimulate the imagination of all enterprising urologists. C TRAVERS STEPHEN M D

**Millin T. Some Observations on the Surgical Treatment of Urinary Incontinence. *Proc Roy Soc Med Lond* 1939 32 777**

The author classifies the types of true incontinence amenable to direct surgical repair as follows: (1) epispadias; (2) aberrant ureteric orifice; (3) acquired fistulas either following childbirth or surgery; (4) congenitally absent sphincteric mechanism; and (5) acquired deficient sphincteric mechanism following childbirth or surgery.

The success of direct surgical attack upon epispadias depends upon extensive freeing of the vesical neck beneath the pubic band and by a rather tight reconstruction of the vesical sphincter. The sutures placed beneath the pubic band and along the corpora cavernosa may have a tendency to shut off the blood supply of the corpora cavernosa and glans penis; these must be watched carefully.

The author has observed only 2 cases of aberrant ureteric orifice. The first case was that of a girl aged twenty-four suffering with incontinence since birth. Urethroscopy revealed an opening in the floor of the urethra just below the bladder neck. The right kidney was filled with stones. A nephrectomy cured the incontinence. In the second case the ureter opened into the prostatic urethra.

Seven girls aged from five to twenty-one years all virtually completely incontinent showed a patulous outlet near the bladder neck and were operated upon with most gratifying results. In view of the youth of the patients and the smallness of the vagina a transvesical approach was used. Suprapubically the internal meatus showed a widely open sphincter and the upper urethra was stretched digitally to facilitate removal of part of the floor. A wedge was then resected from the bladder neck posteriorly; the lateral incisions being carried down into the urethra as low as possible. A series of transverse sutures were then introduced and the urethra and bladder neck tightened about a No. 4 F rubber catheter. When the sutures were tied the catheter was removed and the bladder closed about a Pezzar tube or about a double suction tube. Suprapubic drainage was maintained for ten days when the fistula was allowed to close. While the tube was in position no bladder lavage was employed merely the daily instillation of 2 drams of a 2 per cent mercurochrome or 1/2,000 acriflavine. In every case the ultimate functional result was perfect.

The author believes that the majority of vesicovaginal fistulas should be attacked through the

bladder. As the leakage is essentially from the bladder into the vagina it is all important to secure a watertight closure at the entrance of the n.tula i.e. at the vesical end. A careful freeing of the edges of the n.tula with undermining of the muscularis followed by suturing of the connective tissue between the bladder and vagina and finally a continuous suture of the bladder wall and mucosa should rarely if ever be followed by failure. A boomerang needle is almost indispensable. A diversion of the urine is necessary and the use of the double suction uprapubic tube for from ten to fourteen days is best. Ureterocervical ureterovaginal and ureterocutaneous n.tulas require anatomical repair or nephrectomy according to the degree of infection, the amount of pelvic dilatation and the time which has elapsed since the n.tula has developed.

Stress incontinence following childbirth is particularly amenable to careful suturing of the perineal tissues in most cases. Cystoceles may be grouped as follows: (1) those anterior to Mercier's bar (2) those posterior to Mercier's bar and (3) the combined type. The first group may be further subdivided into (a) those with normal fixation of the vesical neck and the formation of a pouch between the phincter and the interureteric bar and (b) those with displacement of the bladder neck and urethra and descent of the trigonal muscles as a whole together with the bladder neck. By means of cystourethroscopy and cystourethrography these types can be differentiated and the appropriate uprapubic operation can be planned—either ventrifixation of the bladder (Bonney), a Goebell fascial sling about the bladder neck, or the plastic procedure on the vesical outlet as described for congenital incontinence.

Incontinence in males excluding that of neuropathic origin is usually the result of urgent usually perineal prostatic surgery. Transurethral resection may be followed by this complication when the verumontanal landmark is overlooked and the external phincter inadvertently resected. Many operations have been suggested but the ideal one has not yet been found. These operations are based on the theory that the difference between complete incontinence and complete dryness is not the difference between a widely open tap and a tightly closed one but rather the difference between a tap that drips slightly and a tightly closed one. One may expect therefore at least in some cases, to close such a dripping urethra by relatively slight

or indirect pressure. The operations may be roughly divided into 2 groups: (1) those aiming at a decrease of the caliber of the urethra by a plastic procedure causing external compression of the canal, and (2) those consisting of actual removal of tissue, usually a wedge at the vesical neck (Lowry) or the roof of the urethra (Lowley). The operation aiming at the substitution of another muscle for the deficient phincter really fall into the first group because external compression of the urethra is thereby obtained. A large number of muscles have been used for this purpose mostly the pyramidalis together with a strip of the rectus sheath (Goebell, Frangenheim, Stoekel) and the gracilis (Giordano, Deming, Player and Callender). Lowley has proposed replacement of the bulbocavernosus muscle with ribbon catgut.

The following operation is described by the author. A No. 10 F sound is passed down the urethra to the bulb and held in the midline by an assistant. A median incision is then made from the root of the scrotum to the central point of the penileum and carried through Colles' fascia. Blunt dissection exposes the bulb covered by the bulbocavernosus muscle (the bulbocavernosus) and the inferior layer of the triangular ligament. The perineal arteries may or may not be ligated. The bulbocavernosus muscle is then divided along the median raphe, and the two halves of the muscle are drawn laterally. Scissor dissection then separates the corpus pongium with the cavernous urethra from its relatively loose attachment to the triangular ligament until the corpus pongium is free posteriorly from the point where the urethra pierces the triangular ligament anteriorly to the union of the pongium to the corpora cavernosa. Two fingers are easily passed beneath the corpus pongium. Ribbon catgut is then passed twice around the pongium and tied rather firmly over the urethra, all embracing the sound. This suture should be placed as far back as possible close to the site of the faulty external phincter. The bulbocavernosus muscle is then by means of the ribbon catgut, sutured snugly about the corpus pongium, the sound is withdrawn and a well lubricated rubber catheter No. 10 F is passed into the bladder and tied to the glans penis with a silk worm stitch. Colles' fascia is closed with a continuous No. 10 catgut suture and the skin closed with silk worm gut without drainage. The catheter is left in for ten days. While the catheter is in situ the usual bladder lavage and oral antiseptics are employed. LOUIS NEWELL M.D.



general discussion and the second a description of the lesions of the individual bursæ in the different parts of the body. The pathological changes in the common types of bursitis including the acute traumatic chronic calcified and pyogenic are outlined briefly. The author advises conservative therapy in all types except the pyogenic. Most of his cases of acute subdeltoid bursitis responded best to rest and short wave diathermy. Aspiration is indicated when fluid is present and surgery is performed only when conservative measures fail. Ghormley adds a word of caution against the indiscriminate excision of bursæ as they often act as essential pads or lubricating sacs.

All the buræ of the body are illustrated clearly on a diagram of the skeleton. An excellent bibliography is appended.  
DANIEL H. LEVINTHAL, M.D.

Bennett G. E. and Cobey M. C. Hemangioma of the Joints. Report of 5 Cases. *Arch Surg* 1930 38 481.

The authors report 5 cases of hemangioma of the knee joint which were diagnosed and treated by themselves and review 25 authentic cases reported in the literature.

The authors' patients were 3 girls and 2 boys. The age of onset of the condition varied from eighteen months to eighteen years and the duration of symptoms from ninety minutes to eight years. Trauma was not a factor. Swelling was present in all of the cases with pain and recurring attacks of limp and pain on motion in 4. The palpable elastic spongy mass compressible and distensible was evident in only 2. There was tenderness in 2. Muscular atrophy and crepitation were present in only 1 case. Two of the patients received no treatment before operation. 2 were treated with rest in bed and 1 was treated with bandages and casts. The roentgenograms throughout failed to show any abnormality except for erosion of the cartilage in 1 case. In the first case complete excision was attempted but hemorrhage and infection followed and finally amputation had to be performed. Complete excision was possible in only 1 case in which the tumor was pedunculated. Biopsy followed by radium or roentgen therapy was carried out in the other 3 cases with practically complete recovery. The final diagnosis of hemangioma was made and verified by histological study in the first 4 cases. The signs, symptoms and course made the diagnosis certain in the last one.

Surgical excision was the method of treatment used by the other authors but this was successful only in cases in which a pedunculated encapsulated tumor and a small synovial or capsular lesion was present. In 6 of the 24 cases a second operation was necessary for removal of the major part of the tumor and for control of hemorrhage. Complete recovery was reported in 11 cases.

All the cases presented the same striking cardinal signs. They are pain and intermittent swelling since early life with slight limitation in extremes of mo-

tion. The swelling which is present about the patella disappears on elevation of the extremity. There is no marked increase in local heat and usually no cutaneous discoloration. The swelling is boggy almost fluctuant. Occasionally there is a clicking sensation in the knee. Pain is never constant but is occasionally associated with the swelling. Motion of the joint is usually free and painless. Roentgen ray studies are usually negative. Blood can be aspirated from the joint.

The relative early appearance of the tumor and its close association with telangiectasis and various other types of hemangioma as found in the skin, muscle, spine, tendon sheath and other structures of the body suggest a congenital origin. The variations encountered are due to the stage of vascular development to which deviation from the normal occurred.

The pathological picture was typical cavernous hemangioma presenting irregular, blood filled areas separated by serpentine spongy thin tissue septums. No malignant changes were reported.

The earlier the treatment is given the more satisfactory the result. The tumor may take one of three forms: diffuse, pedunculated or encapsulated. In any case it may remain stationary, regress in size or grow very rapidly at any time or age of the patient without apparent cause. For the small pedunculated tumor the treatment is complete excision. Because of the almost uncontrollable hemorrhage with the danger of loss of function of the joint and the fact that amputation or infection may be followed by septicemia, the authors believe that a larger non-pedunculated tumor is more satisfactorily treated by rest and radium or roentgen therapy.  
F. HAROLD DOWING, M.D.

Racugno L. Late Results of Surgical Orthopedic Treatment of Spastic Paralysis of Infancy. (Risultati a distanza della cura chirurgica ortopedica nelle paralisi spastiche dell'infanzia). *Minerva med* 1939 30 60.

From 1920 to 1934 124 spastic children were treated at the Regina M. Adelaide Institute of Turin: 72 had Little's disease, 12 spastic diplegia and 40 spastic hemiplegia. After the surgical orthopedic treatment all children were followed up for several years for the purpose of functional re-education. Racugno was able to trace 74 of the patients and reports the late results obtained by the combined treatment.

Of the 72 children with Little's disease 42 were traced and of these 32 had been treated by plastic lengthening of the Achilles tendon followed by immobilization of the foot for two months while 10 had been treated by subcutaneous tenotomy of the Achilles tendon with immobilization of the foot in slight equinus for two weeks followed by final correction after retraction of the tendon. Examination from three to sixteen years after the intervention showed 21 good, 10 mediocre and 11 bad result. The difference in results depended mostly on

the degree of the disease, the intelligence of the patient, and the persistence of the parents in following for years the functional re education program which is the indispensable requirement to obtain a good result. The result is considered good when the patient is free from defective posture and succeeds in walking securely by himself although his gait may be somewhat strange. Bad results with any kind of treatment are unavoidable in patients with serious diffuse lesions of the extrapyramidal tracts and of the intellectual centers.

Any kind of treatment has proved useless in tetraplegic patients with pronounced changes in the anterior zones of the brain and in the central nuclei (pallidostriate system). In 2 patients of some intelligence with a moderate spastic syndrome of the lower extremities and a slight syndrome of the upper extremities erect posture and walking was made possible while in 2 children of four years with normal mentality and the syndrome of simple congenital rigidity there was a spontaneous tendency to regression.

The best cases for surgical orthopedic treatment were those in which the disease was limited to the lower extremities and the mentality was little or not at all affected. Good results were obtained by lengthening of the tendons and myotomy in equinus of the foot, flexion and adduction of the thigh, and flexion of the knee due especially to muscular retraction. These simple operations eliminated the obstacles to erect posture and moderated the spasm, and thereby made possible the execution of exercises apt to influence the re education of the cortex. In spastic patients with severe muscular spasm the results were poor or negative, but better and more lasting results were obtained with neurectomy, associated or not with lengthening of the tendon. In a case of severe equinus due more to muscular spasm than to contracture posterior arthrodesis gave a permanent result.

Of the 40 patients with spastic hemiplegia, 22 were operated upon. 10 were treated by hypercorrection in a plaster cast left on for four or five months followed by the use of a retention appliance at night and functional re education. 8 were given medical treatment and re education. Results were satisfactory in the last 18 patients. In the cases operated upon in which the equinus had to be corrected, no table improvement in walking was obtained by lengthening of the Achilles tendon on the other hand little was gained by surgery supplemented by orthopedic measures in the upper extremity, in which motor re education is more difficult because of the complexity of the movements to be executed. However section of the epitrochlear process of the humerus with its muscular insertions, associated with arthrodesis of the wrist with slight extension of the hand gave moderate use of the arm and caused esthetic improvement in a patient with flexed and pronated forearm and flexed hand and fingers due to shortening of the extensor tendons.

RICHARD KEMEL, M.D.

Glatthaar, E. The Pathology of Humeroscapular Periarthritis (Zur Pathologie der Periarthritis humeroscapularis) *Deutsche Ztschr. f. Chir.*, 1938, 251-414.

The investigations of humeroscapular periarthritis by Schaer have shown heavy areas of calcification over the greater tuberosity of the humerus near the insertions of the tendons of the supraspinatus and infraspinatus muscles. Involvement of the subdeltoid bursa is a secondary phenomenon. Humeroscapular periarthritis and calcareous subdeltoid bursitis should no longer be grouped under one head. Seldom are the changes of humeroscapular periarthritis observed before thirty years of age; they are found occasionally between the ages of thirty and thirty five years and from then on with an increasing frequency, which reaches a maximum in old age.

A correlation between vascular disease and periarthritis cannot be demonstrated. On the contrary there is a definite association between the changes of periarthritis and those of arthritis deformans. Both conditions frequently start at the same point, specifically in the ligamentous portions of the joint near the tendon attachments. Fraying apart of the cartilaginous attachments of the tendons (raveling tendon rupture) usually occurs ten years earlier than the similar process in the joint cartilages. A causal relationship also exists between arthritis deformans of the intertubercular sulcus and the splitting up of the connective tissue and shredding of the fasciculi of the long head of the biceps tendon. According to this study, then, humeroscapular periarthritis is not to be regarded as a distinct disease but rather as a sequence of events in the widespread physiological aging process of the whole body. Such a conception implies a new viewpoint toward compensation in these cases. (GROSS) AUGUST JONAS, JR., M.D.

Helf, F. W. A New Method of Strapping for Back Strain with Sciatica. *New England J. Med.* 1939, 220-412.

The author describes a new and simple method of strapping for back strain with sciatica, particularly for cases with contracted fascia lata or pain on internal rotation of the leg in the prone position, which indicates irritation of the piriformis muscle.

The treatment consists of relief of the tension of the fascia lata tensor and the gluteus maximus and piriformis muscles by transference of the strain to the lower back by means of straps of adhesive tape applied to the thigh and back. The patient must be in the correct position. The subject lies on the unaffected side with the back toward the examiner (Fig. 1). The legs are flexed 30 or 40 degrees with the knees at a right angle and several pillows are placed between the thighs to bring the upper or affected leg into 20 or 30 degrees of abduction and 20 or 30 degrees of external rotation. Three layers of adhesive tape are then applied. The first layer consists of long strips of 2 in. tape, as shown in the illustration. These are placed beginning 8 cm. above the knee and about 5 cm. from the middle of the



Fig. 1 Longitudinal strips of adhesive tape are placed on the thigh hip and back with the leg in 90 degrees of abduction 40 degrees of flexion and 20 degrees of external rotation



Fig. 2 From below upward transverse pieces of adhesive tape are fastened over the longitudinal strips covering the thigh hip and lower back

anterior thigh. They are brought upward on the thigh over the crest of the ilium 5 cm. posterior to the anterior superior iliac spine and continued onto the small of the back across the midline as far superiorly as the twelfth thoracic vertebra. Similar overlapping longitudinal strips are laid on the thigh crossing the buttock and sacrum onto the lumbar region of the back until the whole of the lateral thigh is covered. From below upward transverse pieces of adhesive tape are fastened over the longitudinal strip covering the thigh hip and lower back (Fig. 2). A third layer of tape is placed similar to the first longitudinal layer. The leg is thereby strapped in abduction, flexion and external rotation which relieves the tension on the muscles involved in these actions that is the *fascia lata tensor* and the *gluteus maximus* and the *piriformis* muscles.

The treatment is based on the assumption that back pain with sciatica may in some cases be due to localized muscle spasm which either disturbs the mechanism of the spine or directly irritates the sciatic or gluteal nerves. Good results with prompt relief of pain are reported in the treatment of this type of case.

No emphasis is placed on after care except the advice that the patient refrain from heavy lifting or heavy work. The tape is removed after from five to seven days. If the patient is symptom free no other treatment is given except exercises for stretching the fascia lata.

I HAROLD DOWNING M.D.

Gilmour J. The Relationship of Acetabular Deformity to Spontaneous Osteo Arthritis of the Hip Joint. *Brit J Surg* 1939 26 700

The onset of spontaneous osteo arthritis in the hip joint is common when the acetabulum is increased in depth. Osteo arthritis affected 80 per cent of acetabular protrusions and appears to develop spontaneously in one or both hips at any age and on the slightest provocation. The deeper

the socket the greater is the proclivity toward osteo arthritic degeneration.

In the normal hip joint there is a protective fluid mechanism which plays an important part in weight transmission and in joint economy. In acetabular deformities there is loss of function and an interference with the operation of the fluid mechanism which is proportional to the increase in acetabular depth. Osteo arthritic degeneration develops whenever this fluid mechanism is impaired, and is accelerated by trauma, superadded infection and any remote cause which lowers the vitality of the individual.

The protective fluid mechanism of the hip joint depends upon the sucker like grip of the cotyloid ring cartilage on the femoral head upon the capsule of the joint and on the synovial fluid. Increased acetabular depth modifies each of these factors responsible for the normal fluid protective mechanism. There is a progressive loss of contact between the cotyloid ring and the femoral head as the acetabulum deepens. The progressive failure in function of the cotyloid ring permits frictional contact between articular surfaces. Capsular shortening accompanies increased acetabular depths and fixed flexion deformities commonly follow. These flexion deformities modify the joint mechanism considerably. Reduction in the supply of synovial fluid probably follows atrophy of the intra articular synovial membrane from pressure as a result of capsular shortening.

Roenitgenograms diagnostic sketches of the roenitgenograms showing the distribution of iodized oil in hip joints in flexion and extension and enumeration of the roenitgenographic findings in osteo arthritic hip joints are presented.

ROBERT P. MONTGOMERY M.D.

Nicole R. Osteochondritis Dissecans of the Hip Joint and Accidents (Osteochondritis dissecans des Huesfigelenkes und Unfall). *Ztschr f Unfallmed u Berufshygiene* 1938 32 212

The author reports 3 of his own cases of osteochondritis dissecans of the hip joint. Since the lesion is always doubtful and also rare his cases were presented in the form of roentgenological studies. There is no pathognomonic syndrome presenting a characteristic clinical picture for diagnostic purposes. The roentgen plates are the decisive factors.

Osteochondritis dissecans in other joints does not present the same conditions as in the hip joint. In the latter the following peculiarities are notable: the more advanced age of the patient, the marked enlargement of the involved area, the absence of a joint mouse, the greater tendency of the joint to develop arthrosis deformans, the absence of any occupational condition favoring its occurrence and finally the absence of a definite history of a causative accident. The problem of its cause is the same as in Legg Calvé-Perthes disease. The author states that even though a previous trauma could not be considered as the cause we must reckon with



certain mechanical factors which would favor the occurrence of the disease. In addition, special tendencies during the development and the mal development of the epiphysis and, above all, the time of epiphyseal ossification must be considered. The developmental irregularities of the epiphysis do not lead to a characteristic disease of the bone, but only to an abnormal formation with physicochemical differences in the marginal zone and to dissimilarity in the resiliency of joint action. The result is a local change with a lowered resistance to mechanical and especially to tangentially operating influences. In this respect osteochondritis dissecans, Pott's disease and epiphyseal separation of the hip joint are pathogenetically similar processes. According to the developmental stage of the epiphysis either one or the other form of the disease occurs.

These theoretical considerations, however, do not constitute a basis for practical substantiation. An accident is causative in the ordinary fracture. Osteochondritis dissecans and joint mouse *per se* are not affections of a traumatic character. The appearance of these conditions immediately after an injury does not establish the fact that they are the result of the injury; neither would the separation or the mobilization of a joint mouse, which might have occurred sooner or later anyhow, prove to be a consequence of the trauma. On the other hand, the transitory condition of incarceration with simultaneous contusions and distortional injuries following a proved severe accidental traumatism creates a liability. However, if weeks have passed since the accident, liability is more difficult to establish. We do not possess sufficient clinical, roentgenological, and pathologic-anatomical criteria to differentiate between the "osteochondritis dissecans of Koenig" and the hip joint fracture caused by an accident. Judgment must, then, depend upon proper regard for practical evidence and above all upon the patient's clinical history preceding the accident. In hip joint osteochondritis this causative sequence is not to be considered as to date, such a condition has never been reported as following an accident and liberation of a joint mouse practically never occurs in the hip joint. Neither is workmen's compensation justifiable as the regular joint activity, which leads to this pathology, never overtaxes the maximal physiological requirements.

(HEINEMANN GRUEDE) MATTHIAS J. SEIFERT M.D.

#### Alpert L. Tuberculosis of the Symphysis Pubis *New England J. Med.* 1939 220 786

The author reports his experiences with the treatment of 4 cases of tuberculosis of the symphysis pubis in 2 of which the symphysis was splinted in directly by ankylosis of both sacro iliac joints.

Previous reported operative methods of treatment of this lesion have been largely directed at the local lesion such as thorough curettage of the infected bone and drainage of any abscess present in accordance with the accepted treatment for osteomyelitis. Autogenous bone grafts have also been

used, being placed across the symphysis but in general bone grafts do not attach themselves favorably in a tuberculous field and accordingly the indirect method of splinting was considered more favorable.

The type of fusion operation is considered of secondary importance. The operation is performed in a clean field and on healthy bone and any type of fusion, if efficiently performed, will result in ankylosis of the joint. Both the Smith-Petersen and Campbell methods were used. Only one joint was fused at a time.

The author believes that by indirect splinting of the symphysis with sacro iliac fusion there is a better chance for the tuberculous process to subside and the pubis to fuse spontaneously. Very favorable results were obtained in the cases reported as compared to other methods of treatment; however, the series is too small and the period of observation too short to permit proper evaluation of the method at this time.

F. HAROLD DOWNING M.D.

#### Jirasek, A. The Future of Surgery of the Relaxed Knee Joint (*L'avenir de la chirurgie du genou mou*) *Rev. d'orthop.* 1939 26 97

In the surgical treatment of the relaxed knee Jirasek notes that the meniscus plays the primary role. He has found that the meniscus in such knees may be abnormally mobile, and the condition resembles very closely that observed when the meniscus is torn or dislocated. If the meniscus is injured it should be removed in its entirety. However, the author is convinced that pathological conditions in the meniscus are not the only factors in the alteration of tone and function of the knee joint. Absence of the intra-articular fatty tissue, and pathological changes in this tissue such as hypertrophy, sclerosis, or necrosis, may also be a factor and should not be overlooked in operations on the joint. Absence of the peritarticular fat interferes with the mechanical balance and nutrition of the synovial membrane, and causes it to be drawn into the interior of the joint with certain movements of the limb. Peritarticular inflammation of the joint may occur after certain injuries; the author has had good results in the treatment of this condition with local infiltrations of novocaine.

Another factor of importance in injuries of the knee joint is the condition of the synovial membrane, either its power of secretion or its power of absorption may be diminished; there may be a diminution in the amount of synovial fluid, sometimes entire absence of fluid (dry knee) or an increase in the amount of fluid (hydrarthrosis). Thus it is evident that in the treatment of the relaxed knee, not only the mechanical conditions of the injured meniscus, but also the functions of the synovial membrane and the fatty tissue must be considered. The future of the surgical treatment of injuries to the knee joint depends upon a more careful study of these factors and upon a development of more effective therapeutic measures if the aforementioned functions fail.

ALICE M. MEYERS

## FRACTURES AND DISLOCATIONS

Perves and Badelon. Results of the Surgical Treatment of Recurrent Dislocations of the Shoulder (Résultats du traitement chirurgical des luxations récidivantes de l'épaule). *Mém Acad Chir Paris* 1939 65 349

In 1924 Oudard described the technique which he used in the treatment of recurrent dislocation of the shoulder since 1921 at the Hospital of Sainte Anne at Toulon. The principal point of the technique consisted in reinforcement of the anterior portion of the capsule by shortening the subscapular muscle and in the creation of an elongated coracoid apophysis. The latter was at first produced by division of the coracoid with a Gigli saw at the junction of its vertical and horizontal part and introduction of a tibial graft between the two fragments. Later Oudard found it simpler to divide the horizontal portion of the coracoid process into internal and external parts permitting the former detached at its base to glide over the external fragment. Fusion was obtained by leaving the two fragments in contact for about 1 cm. In this way an elongation of from 2.5 to 3 cm was obtained which sufficed in most cases. This technique has since been adopted by nearly all French surgeons.

Many surgeons felt however that the coracoid intervention would suffice *per se* without shortening of the subscapular muscle and several modifications of the Oudard method appeared. Others regarded the shortening of the subscapular muscle as the most important feature of the operation and used it without the coracoid procedure. At present the simplified Oudard operation may consist either in elongation by means of a graft or in elongation by means of plastic operation on the bone.

In an attempt to evaluate the comparative merits of these two methods the writers review the statistics of results which have been obtained by various surgeons.

From 1923 to 1937 about 31 patients were treated at the Sainte Anne Hospital of Toulon. Of these 23 reported for re-examination or replied to questionnaires. It is probable that there was no recurrence in the 8 patients who failed to reply. Of the 23 patients 10 were operated upon by the original Oudard technique with 1 recurrence after five years. Eight patients were treated by elongation only accomplished by division of the coracoid. There was 1 recurrence after seven months. Five patients were operated upon by the Wilmoth Tarnier method (in section of a graft into the fenestrated coracoid and coracobrachialis). There was 1 recurrence after one year. Judgment of the value of an operation requires that several years should have elapsed. The percentage of recurrences serves as a criterion only if based on a large series of cases. Other recurrences after operation included 2 cases mentioned by Oudard and 4 cases reported in the literature, all having been treated by the Wilmoth Tarnier method. No conclusions can be drawn as regards the advantages or

disadvantages of the latter until a larger series has been reported. However from the results studied it would appear that such grafts may be resorbed completely or diminish so markedly that the desired continuity with the coracoid is not attained.

The causes of recurrence are complex and frequently obscure. Wilmoth reported 1 case treated by simple elongation of the coracoid by a graft. There was no recurrence for nine years. Tavermer reported a similar case without recurrence for two years. Lenormant described 2 cases treated by the complete Oudard operation without recurrence for two years and eleven months and seven months respectively. He did 5 elongations of the coracoid with graft without recurrence in 4 for one year and eight months, two years and four months, seven months and four months respectively. There was a recurrence after four months in 1 case in which a second operation revealed a pseudarthrosis of the graft. A new graft was inserted and there was no further recurrence for two years and ten months. Julien mentions a case of Menegaux with elongation of the coracoid by graft and no recurrence for one year. Bazy reported 11 cases treated by elongation with graft. He was greatly pleased with the results and gave detailed results in 3 cases: 1 having remained without recurrence for six years; 1 for two years and seven months; and the third for eighteen months in spite of the patient's having suffered a violent injury. Avril reports 5 cases without recurrence but none was observed for a year. Gosard described a case treated by the complete Oudard operation without recurrence for two years. Gernez patient had no recurrence for six years. Bloch describes 3 cases treated by simple elongation and graft with 1 recurrence. In this case a second operation revealed that the graft had been largely resorbed. The duration of cure for the 2 other cases was not given. Desplas reports 6 cases but without end results.

Of 9 cases reported by Cuneo 4 remained without recurrence for nine and one half, nine, five and one half and five and one half years respectively. There were 2 recurrences: one after an interval of eight years, the other after an interval of one and one half year. In 3 of the cured cases the osteoplastic elongation was used and in 1 the clavicular graft. In the 2 cases of recurrence osteoplastic elongation was used in one and the clavicular graft in the other. Gouverneur did the complete operation in 2 cases without recurrence for eight and two years respectively and simple elongation in 1 case with no recurrence for five years. Decker observed no recurrences after three years in 6 patients operated upon by him by shortening of the subscapular tendon and osteoplastic elongation of the coracoid.

The present writers describe 5 personal cases treated by elongation of the coracoid with graft with 2 recurrences: one following violent injury and the other following a simple strain. In one of these cases the graft was resorbed and in the other there appeared to be a fracture between the graft and coracoid.

Thus recurrences seem more frequent following simple elongation of the coracoid with graft

The authors recommend the complete Oudard operation as giving the best results

EDITH SCHANCHE MOORE

#### Hunt G H Fracture of the Shaft of the Ulna *J Am M Ass* 1939, 112 1242

Fracture of the shaft of the ulna with dislocation of the head of the radius is described as a fracture dislocation which occurs much more frequently than is ordinarily recognized. The fracture of the shaft of the ulna is readily recognized but the dislocation of the head of the radius is not recognized primarily because many roentgenograms do not take in the elbow joint in both views. When the fracture of the shaft of the ulna alone is recognized and treated the percentage of permanent disability is quite high. In any indirect violence, the author believes that it would be very difficult to put enough stress on either the radius or ulna to fracture it without having some type of lesion of the other bone. It is imperative therefore that when one bone is fractured, this type of dislocation of the head of the radius should be especially looked for. For all practical purposes, injury to the ulna by indirect violence means injury to the radius also.

Roentgenograms in two planes are required. If the radial diaphysis points towards the capitellum in both views well and good if in either one of them it is pointing somewhere else than directly at the capitellum, the epiphysis of the radial head is either dislocated or separated.

After the diagnosis has been made, the author suggests that the best orthopedic or fracture special list available may well be consulted at the beginning rather than after several weeks of unavailing treatment. The difficulty in this type of fracture lies first in the closed reduction of the dislocated radial head into place between the torn ends of the ruptured annular ligament and second in that when the radius is reduced to its normal length it is quite a difficult feat to get the ends of the ulna into apposition so that healing will result. The reduction of the dislocated radial head is often impossible without an open operation. If operation becomes necessary the radial head should be replaced in its normal position between the torn ends of the annular ligament and sutured.

It is better to have ulnar non union with the radius restored to normal than to leave the patient with a dislocated radial head. If operation to replace the radial head becomes necessary, the internal fixation of the ulna may be advisable. Late operation in neglected cases must be adjusted to the conditions present such as resection of the radial head and bone grafting of the ununited ulna.

Three cases of fracture of the ulna and dislocation of the radial head are presented. In the first 2 cases, a satisfactory reduction of the dislocated radial head and satisfactory reduction and union of the fractured ulna were obtained. In the third case, the

fracture dislocation was treated unsuccessfully for two and one half months and then an open reduction of the dislocated radius and a bone graft of the ununited ulna were performed with apparently good results.

RICHARD J BENNETT JR M D

#### Wenzl O Vertebral Luxation (Ueber Wirbellsaxationen) *Beitr z klin Chir* 1937, 166 53

In dislocations of the vertebral column one must differentiate between luxation alone and luxation with fracture. The diagnosis of a dislocation fracture is often difficult even with the aid of stereoscopic roentgenograms, and yet from a large clinical experience in this work it is difficult to determine neurologically whether the fracture or the dislocation is responsible for symptoms and signs. The author describes the mechanism of luxations through which injury to the spinal cord occurs. Changes are described ranging from the simplest block to the most severe laceration. It is noted in the true luxation that there seldom are medullary symptoms. However, if the pressure of the luxated vertebrae on the medullary substance is not removed its blood and lymph supply will be very quickly and permanently injured. A removal of the posterior lamina of the vertebral canal may or may not help. If help is to be obtained it must be quickly or there will be permanent changes in the spinal cord. By waiting, this pressure damage will be markedly increased. Simple laminectomy as well as extension of the spine will aid even though laminectomy is a more dangerous procedure.

The question arises whether the dislocated vertebrae should be reduced by means of closed or open reduction. The bloodless or closed procedure has had its greatest use in the cervical portion of the vertebral column however if the dislocation has occurred further down and success is so uncertain or the luxation so extensive that there is danger of secondary harm to the medulla, then the safest way is open reduction, the medulla will be released from the effect of pressure, tension is liberated, and the circulation of the spinal fluid and of the blood and lymph streams to the medulla is reestablished.

The results of the various methods were given. The end results of conservatively handled cases approached those of fracture alone. The results of laminectomy were not superior to those obtained from conservative treatment. The open procedure was very rarely used and then only in those cases which were poor risks from the beginning. In these the best results were obtained, but such results would scarcely have been attained through conservative handling. The results of the closed and open reductions are therefore dependent upon the time of operation as well as the time which has elapsed since the injury. The time factor is especially significant in closed reductions. Even though closed reduction gives some degree of satisfactory results, one must still consider cases in which open reduction is indicated. The operation is described.

After the vertebral arch is exposed and the muscles of the back retracted the articular processes are exposed as well as the spinous processes and posterior arches of the remaining intact vertebrae. Then palpation is done along the posterior dorsal surface in the curve of the dislocated vertebrae the arch is grasped with two bone hooks and further reduction is governed by the intact vertebral arches. The successful reduction of the vertebrae without difficulty and without resection of the articular processes is carried out by extension of the vertebral column. In this manner the elevators can be applied to the articular processes and good results will be obtained. The tissue superimposed on the dura (periosteum and musculature) and hematoma are withdrawn from the arc space. The vertebra is reduced and the articular processes proceed to function and carry the weight of the vertebral column again as previously. There is no possibility of a recurrent dislocation of the vertebrae as long as the vertebral column is maintained in the position of extension.

In such cases there is the possibility of a disastrous result to the medulla during interventions. The attempt at reduction depends upon the rapidity of the disappearance of shock in each case. Unfortunately there are usually other injuries to the patient which must be considered before contemplating reduction.

As soon as early open reduction has become generally accepted it will be attempted in a series of cases the vertebral dislocation will have lost much of its terror and the prognosis will improve. It will then be considered a simple vertebral operation according to the experience of the individual authors. In dislocation of the atlas the author is in favor of the closed reduction especially when life is in danger but the anatomical relation can still be obtained. Wire may be used for fixation of the cervical vertebrae to obtain bony healing of the fracture of the dens epistropheus. Dislocation fracture may be treated in a similar manner though successful results were very few. There is a difference of opinion regarding the open reduction of vertebral dislocation and fracture dislocation.

(BODE) RICHARD J. BENNETT JR. M.D.

McFarland B. Congenital Dislocation of the Hip.  
*Brit J Surg* 1939 26 791

Prolonged Thomas splint skin traction has been successfully used by the author in 18 cases of dislocation of the hip of congenital origin in preparation for a shelf operation in patients from ten to sixteen years of age as a substitute for manipulative reduction under general anesthesia in younger patients and in cases with pathological dislocation of the hip.

Closed manipulative reduction is seldom possible after the age of ten years and a stiff hip is a common result following open reduction because of pressure of the femoral head against the acetabulum by force of the previously shortened soft tissues. In many cases the acetabulum is inadequate and the absence

of an adequate buttress against which to lodge the head of the femur makes retention of the reduced femoral head uncertain.

When the head of the femur has been pulled down to below the level of the true acetabulum by skin traction from two to eleven months a shelf is usually made by turning down a large plaque of bone from the false acetabulum the point of leverage being the upper rim of the true acetabulum. The shelf is fixed in position by wedges of bone cut from the ilium. During the operation the leg is held in an extended position to facilitate the operative procedure. Traction may be maintained during the operation and is used for about six weeks following the operation. A plaster cast is then applied and worn for two months. Walking is started prior to or following the removal of the cast.

Photographs of a patient roentgenograms and schematic drawings of the technique for the shelf operation and of the author's traction apparatus are presented. The apparatus combines the advantages of the fixed type of traction and the continuous weight traction. A ratchet is used so that any length gained by traction is held as a fixed lengthening.

ROBERT P. MONTGOMERY M.D.

Crego C. H. Jr. The Use of Skeletal Traction as a Preliminary Procedure in the Treatment of Early Congenital Dislocation of the Hip.  
*J Bone & Joint Surg* 1939 21 353

Prior to 1933 the author has found no reference in the literature relative to the use of skeletal traction as a preliminary procedure to either open or closed reduction in the treatment of children under seven years of age with congenital dislocation of the hip. He finds that this procedure is less radical than the old classic one of forcible stretching and massaging of those structures which hinder manipulative reduction and states that if the mechanical obstacles can be gradually and effectively stretched and relaxed by preliminary skeletal traction the actual placement of the head of the femur into the acetabulum can be accomplished with no trauma whatever and the post-reductive intra-articular pressure can be eliminated. Especially in children open operations are severe tests of their endurance and a preliminary procedure which alleviates the necessity both of radical cutting of the soft parts and the forcible use of the hip skid should be a distinct advantage from all angles. Preliminary traction also has the advantage of elimination of the post-reductive intra-articular pressure of the head against the acetabulum during the immobilization period and when acetabular reconstruction and shelving operations are done preliminary skeletal traction avoids the tendency toward poor displacement so frequently seen when the head has not been adequately pulled down opposite the center of the acetabulum.

Crego uses a wire traction but has designed his own traction bow in 4 different sizes. The technique of inserting wire and applying traction is cited in detail. Well leg counter traction has been used but

has been found to be less satisfactory than simple elevation of the body especially in very young children. In children under four years of age the initial weight used is about 10 lb and additional weight is added according to the individual requirements of each patient. The descent of the head should not be too rapid. Weight is added or subtracted so that the head will be completely pulled down in about ten days or two weeks. The level of the trochanter should be checked roentgenographically. The amount of traction is reduced so that there will be just enough pull to provide displacement of the head and the traction should be continued at least ten days or two weeks after roentgenographic examination shows the head to be well down opposite the lower half of the acetabulum. In those cases in which it is certain that the acetabulum is too shallow or its roof too vertical to hope for permanent reduction and in those cases in which closed reduction cannot be effected without an anesthetic, open operation is indicated. In several instances, traction was applied with a wire through the tibia, but this was not satisfactory.

Crego has used this method of skeletal traction as a preliminary procedure to either open or closed reduction in 27 children under the age of seven years with posterior congenital dislocation of the hip. In 11 cases the deformity was bilateral which made a total of 38 hips which were treated. There have been 29 closed reductions without anesthesia and 9 open reductions whereas previous to the use of skeletal traction 80 per cent of the writer's cases in children under seven years of age were treated by open operation. The acetabulum was reconstructed in 15 instances, purposely not reconstructed in 4 instances, and should have been reconstructed in 3 additional cases.

EMIL C. ROBITSHKE, M.D.

De Moraes, F. Isolated Fractures of the Greater Trochanter (*Les fractures isolées du grand trochanter*) *Rev d'orthop* 1939 26 223

While isolated fractures of the greater trochanter are considered to be of rare occurrence, Moraes is of the opinion that such fractures would be found more frequently if radiographic examination were made in every case of contusion of the hip.

Three cases are reported occurring in men aged twenty three, forty two and sixty three years, respectively. In 2 of these cases, the patient had tried to catch himself when slipping on a slippery walk, and had made a violent and uncoordinated movement of the muscles attached to the greater trochanter. In the third case (that of the oldest patient) there had also been a sudden but less violent movement before the symptoms developed. In 2 cases the patient was unable to walk and in 1 case he walked with a marked limp. On admission to the hospital the extremity was in slight flexion, abduction and external rotation. Any attempt to place it in the position of adduction and internal rotation caused pain. In 1 case admitted twenty four hours after the injury there was ecchymosis and edema in the region of the trochanter. These symptoms are characteristic of fracture of the greater trochanter, but radiographic examination should be made to confirm the diagnosis.

In the treatment of these fractures without displacement or with very slight displacement, immobilization of the extremity in complete abduction and external rotation for six weeks gives good results. This was the method used in 2 of the cases reported. In the third case the displacement of the fragment was such that operation was advised but refused. As there is often an associated osteoporosis in such cases, wiring of the fragment (cerclage) is the best method of fixation.

ALICE M. MEYERS

# SURGERY OF THE BLOOD AND LYMPH SYSTEMS

## BLOOD VESSELS

Uggeri C. Tuberculous Phlebitis (Sulla fitea tuberculare) *Chin chir* 1939 23 283

Uggeri distinguishes between tuberculous phlebitis in which histological examination demonstrates the specific nature of the disorder and phlebitis in tuberculous subjects in which its specific nature although probable cannot be demonstrated with certainty.

Tuberculous phlebitis is divided into periphlebitis and endophlebitis. Periphlebitis is due to propagation of the infection from a focus adjacent to the vein and attacks preferably the small veins these are easily thrombosed while the large veins may show proliferation of the intima without thrombosis. Endophlebitis is due to localization of the tubercle bacillus in the intima and may present various anatomical pathological aspects. In the large veins the most common form is the polyp which floats in the blood stream and may attain considerable length. The center of the polyp is composed of typical tuberculous granulation tissue partly cavaled its periphery is covered by a layer of connective tissue originating from the intima. Tubercle bacilli may be demonstrated in the tissue. In the smaller veins the most common aspect is that of obliterating thrombo endophlebitis. The process is identical with that causing the polypos form but the narrowness of the vein leads to occlusion. Endophlebitis occurs decidedly more often than periphlebitis and attacks in the order of frequency the pulmonary suprarenal dura mater renal and splenic veins. Isolated cases in other veins have been reported. From the clinical point of view the tendency toward localization of the process in the visceral veins obscures the symptoms which may even be absent in many cases it is interesting in that it may give rise to generalized miliary tuberculosis especially from the pulmonary veins.

Phlebitis in tuberculous subjects has been divided into four clinical forms

1 Late phlebitis in patients with cavities. Its most frequent localization is in the superficial or deep veins of the lower extremities and its symptoms are fever pain the presence of a hard painful cord corresponding to the course of the vein edema and functional disability a superficial collateral circulation may develop.

2 Early phlebitis. This is rare may appear in various types of tuberculous subjects including the apparently healthy and initial cases and occurs usually in the superficial veins of the lower extremities for the most part unilaterally and generally insidiously. It begins with paresthetic sensations which are gradually replaced by localized pain. This pain disappears completely within two weeks. Localized white slightly tense edema which does not pat

sets in a few days after the appearance of pain and is resorbed by rest in bed in from fifteen to twenty days. Functional disability is very slight and a collateral circulation usually does not develop. Its differential diagnosis includes chlorotic rheumatic gouty syphilitic gonorrheal typhoid and subacute septicemic (Vaquez) phlebitis.

3 Superficial phlebitis of the upper extremities. This is rare and may involve successively various segments of the veins on either side. Its symptoms are slight and fleeting there is slight localized pain especially during movements limited edema and redness along the course of the involved vessel. It must be differentiated from syphilitic phlebitis. Its local prognosis is good but its general prognosis unfavorable.

4 Phleboscclerosis. This is frequently found in tuberculous cachexia and may be uniformly distributed over the vein or under the form of plaques palpation reveals a hard mobile painless cord.

All authors agree that the tuberculous origin of phlebitis can be considered as certain only when positive results have been obtained by inoculation of the guinea pig with blood but that it may be considered as probable in the other cases. As to its pathogenesis they do not feel justified in deciding between the endophlebitic and the periphlebitic origin but they incline toward the latter.

Uggeri describes and discusses 2 personal cases of early phlebitis in an apparently healthy subject and a case of phlebitis that occurred during the last stages of tuberculosis. The ultimate course of the 2 cases confirms the unfavorable prognosis attributed to this complication. He believes that these cases of phlebitis are not caused by ordinary bacteria but by the tubercle bacillus. Therefore he recommends the classification of tuberculous phlebitis with or without specific granuloma the latter no matter in what stage of tuberculosis it may occur would invariably reflect a condition of peculiar deficiency of the organic defense powers against the specific infection.

RICHARD KENEL M.D.

Ochsner A and DeBakey M. The Treatment of Thrombophlebitis by Novocaine Block of the Sympathetics. *Surgery* 1939 5 491

Because of recent experimental and clinical investigations the authors are in hearty agreement with the contention of Lenche that the clinical manifestations in thrombophlebitis are due largely to the vasomotor reflex which originates in the thrombosed segment that the symptoms can be relieved completely and that the convalescence will be materially shortened by blocking the sympathetic and thus breaking the reflex.

The authors have used novocaine block of the regional sympathetic ganglia in a number of cases and have obtained uniformly successful results.

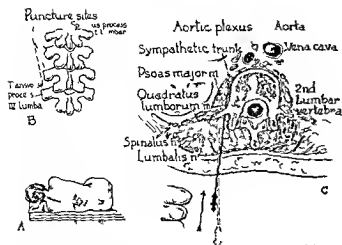


Fig 1 Technique of lumbar sympathetic block in thrombophlebitis of lower extremities *A* Lateral recumbent position of patient *B* Cutaneous sites of puncture lie on a horizontal level with and two and one half finger breadths lateral to upper part of spinal processes of first four lumbar vertebrae. The puncture sites in the skin are immediately over the transverse processes of the respective vertebrae *C* Each needle is inserted vertically until transverse process of corresponding vertebra is reached as represented by dotted needle. Direction of needle is then changed slightly and inserted two and one half finger breadths beyond the transverse process so that its point lies near the anterolateral surface of the body of the vertebra where the sympathetic chain lies

Immediately following the injection there has been complete relief of pain which in some instances has been permanent. In other cases subsequent injections have been required, but only rarely has it been necessary to use more than three injections. The temperature declines within twenty four hours and generally is normal within from seventy two to ninety six hours. The associated swelling of the extremity begins to diminish within the first twenty four to forty eight hours and usually within a week to ten days has disappeared completely. In more than one half the cases the extremity has returned to its normal size within four days after the beginning of the treatment. All of the patients in this group were well within two weeks and all walked out of the hospital within or shortly after, that period of time. Equally as good results can be obtained in the upper extremity as in the lower.

The technique of the injection of the lumbar sympathetic ganglia as employed by the authors, is extremely simple and may be performed with the patient in bed. The patient is placed in the lateral recumbent position with the affected side up (Fig 1 A). Wheals are made in the skin by intracutaneous injections of 1 per cent novocaine at points approximately from 2 to 2½ finger breadths lateral to the upper part of the spinal processes of the first, second, third and fourth lumbar vertebrae (Fig 1 B). These points of the skin lie immediately over the transverse processes of the corresponding vertebrae. A 20 or 22 gauge needle, 8 to 10 cm in length, is inserted vertically through each wheal until the transverse process of the corresponding vertebra is reached, usually a distance of about 4 or 5 cm. The direction of the needle is then changed slightly, either superiorly or inferiorly so that it can project beyond the process and is pointed slightly toward the midline. The needle is then inserted another 2½ finger breadths so that its point impinges against the anterolateral surface of the body of the vertebra in the retroperitoneal space (Fig 1 C). Through each of the needles, 5 cc m of 1 per cent novocaine are injected. Before injection aspiration should be done in order to avoid the injection of novocaine into a blood vessel.

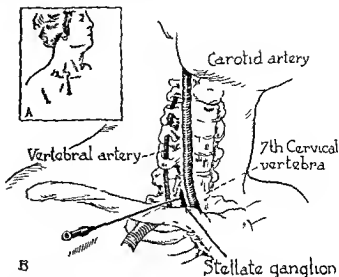


Fig 2 Technique of stellate ganglion block by anterior approach *A*, Cutaneous site of puncture is 1 cm medial to the midpoint of the clavicle and immediately over its upper border. *B* Needle is introduced on a horizontal level with the upper border of clavicle and directed posteriorly and medially at a 45 degree angle with the midline. The point of the needle impinges again t anterolateral surface of the body of the seventh cervical vertebra or at the junction between the seventh cervical and first thoracic vertebrae

The authors have had 2 cases of thrombophlebitis involving the upper extremity in which this method of therapy was used. The technique of injection of the cervical dorsal ganglia is extremely simple and either the posterior or the anterior approaches may be employed. Both approaches are described but the authors prefer the latter, the technique of which is a modification of that described by Leriche. This consists of the production of an intracutaneous wheal of novocaine at a point 1 cm medial to the midpoint of the clavicle and immediately over its upper border (Fig 2 A). A fine lumbar puncture needle is introduced on a horizontal level with the clavicle and directed posteriorly and medially at a 45° angle with the midline (Figs 2 B and 3). The point of the needle, after being introduced for a distance of from 6 to 7 cm impinges against the anterolateral surface of the body of the seventh cervical vertebra, or at the junction between the

seventh cervical and first thoracic vertebrae. The point of the needle, after being introduced for a distance of from 6 to 7 cm impinges against the anterolateral surface of the body of the seventh cervical vertebra, or at the junction between the

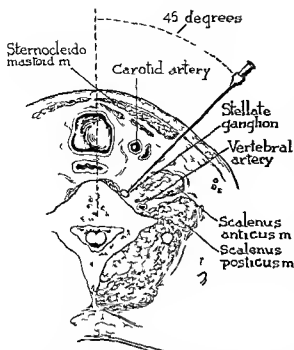


Fig 3 Diagrammatic drawing illustrating introduction of needle posteriorly and medially at a 45 degree angle with the midline so that the point of the needle impinges against anterolateral surface of the body of the seventh cervical vertebra or at the junction between the seventh cervical and first thoracic vertebrae where stellate ganglion lies

seventh cervical and first thoracic vertebrae where the stellate ganglion lies. After it is ascertained by aspiration that the needle is not in the vessel 10 c.c. of 1 per cent novocaine are introduced.

Groth K. E. Several Cases of Recurrent Arterial Emboli in the Extremities (Emige Faelle von rezidivierender Arterienembolie in den Extremitaeten) *Arch f klin Chir* 1939 194 411

Groth discusses 3 Swedish and 3 reported cases of recurrent embolism in the same limbs. As the result of conscientiously examined Swedish statistics the author believes that such occurrences amount to about 4 per cent.

His own case was remarkable in that the first emboli occurred almost simultaneously in 3 limbs viz. in both legs and in the right arm of the patient. By means of direct arteriotomy at the sites of the blockings (left popliteal artery, right common femoral artery, and right brachial artery) as well as by massage of the exposed arteries the emboli could be excised and the circulation immediately and well again perfectly re-established. Postoperatively there was no special difference in the arm but the right leg showed sharply extended toes and only a little movement in the ankle with hard ischemic muscu-

lature. The left leg slowly developed a dry gangrene in parts and it was amputated by the Gritti method. The laboratory examination revealed a normally healed arteriotomy wound the posterior tibial artery was filled with thrombotic masses, the anterior tibial artery was patent.

About five months after the first embolism the patient was afflicted with a second attack. He then had a sensation of both arms dying without pain and without their feeling cold. This lasted a few minutes then was followed by most violent pains in the upper abdomen, defecation and frequent non bloody vomiting. The upper abdominal symptoms diminished in one and one half hours but then a feeling of coldness and pains in the right leg and foot occurred. At the site of the former arteriotomy a vascular blocking 3 cm in length was found the efferent vessel was pulseless. The embolus was removed through a little deeper incision at this time. The abdominal pains vanished at once. However before the incision in the vessel wall was closed a new blocking of the artery directly at the wound occurred. This clot was removed and after suture of the vessel the circulation was completely restored. The abnormally sharp extension of the toes was corrected a month later by tenoplasty. This was followed ten days later by an apparently fatal brain embolus which however was also dislodged. The warning is justified that such patients should not be subjected to operations unless absolutely indicated.

From the clinical findings and the time element of occurrence and recurrence the assumption is justifiable that a large embolus was discharged from the heart caused a short obstruction to the circulation in the arms then lodged in a branch of the aorta leading to an abdominal artery in which it remained fixed. Later a dislodged segment of this embolus was carried to the typical location of the femoral artery from where it could travel no further. The sudden release of the circulation following embolectomy then liberated the rest of the embolus which was carried to the arteriotomy sites. The preoperative treatment of this patient consisted in the administration of eupavarin and acetylcholin both of which were ineffective. This failure doubtlessly was due to the fact that the expected arterial spasms were either too mild or entirely absent.

The other cases were reported in detail also. All of the patients were between forty four and sixty two years of age. Four of the six were men. The vessels involved were the popliteal and brachial arteries the bifurcation of the aorta and the axillary and femoral arteries. The clinical symptoms often were characterized by a marked constitutional let down shortly after the embolism occurred. The local symptoms are definitely known. The embolus always was found to be quite a distance proximal from the upper border of the skin discoloration. In all the recurrences the disease was acute and the clinical picture quite generally simulated the first appearance of the embolism with exception of the pain which was markedly less or entirely absent.



The treatment consisted of a simple arteriotomy with definite avoidance of the introduction of any special instruments into the blood vessels. The most favorable results of arteriotomy were obtained during the first ten hours in 2 cases; however, the time was eleven and twelve hours respectively. All secondary operations of the embolisms were done in the ten hour limit, often even earlier. The immediate local results of secondary arteriotomies and their final outcome corresponded with the favorable outcome of the first operations taken collectively.

The results of treatment in the recurrences were good in 5 cases and bad in 1 (gangrene of the arm). Regarding the significance of the collateral circulation in sustaining the affected parts, the author's opinion, supported by case reports in the literature, is that in a number of embolectomies the success was undoubtedly due to the fact that the collateral circulation took up the course of the blood rather than that the blood followed its usual course through the affected vessels. The collateral circulation in the reported cases, however, was of no service to the affected limbs. The suspected influences of the sympathetic nervous system require more substantiating proofs. (DREGG) MATTHIAS J SEIFERT M D

## BLOOD, TRANSFUSION

Wadell W W Jr, and Guerry D III. Vitamin K and the Clotting Time with Special Reference to Unnatural Bleeding of the Newly Born. *J Am M Ass* 1939 112 2259

The desirability of finding some agent which might materially lessen the incidence of cerebral accidents and unnatural bleeding in the neonatal period prompted this study of the effect of Vitamin K concentrate on the prothrombin clotting time and the clotting of the blood of the newly born. The authors review the literature in regard to the use of Vitamin K. It has been found to be an anti hemorrhagic factor. They then give the results of using Vitamin K on 10 newly born infants and of the study at the same time of 10 other newly born infants who did not receive Vitamin K. They give charts showing the blood clotting time of those infants who have not had Vitamin K and how the blood clotting time is decreased in those infants who have received Vitamin K concentrate. It is the authors' hope that their studies may materially aid in the decrease of intracranial hemorrhage in the newly born.

PAUL MERRELL M D

# SURGICAL TECHNIQUE

## OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Devenish E A and Miles A A The Control of Staphylococcus Aureus in an Operating Theater *Lancet* 1930 236 1038

A high incidence of suppurative due to staphylococcus aureus in clean operation wounds was found to be due to the leakage of staphylococcus aureus through the glove punctures from the skin of a surgeon who proved to be a skin carrier.

The staphylococcus aureus present in the air of the theater and on the skin of the patients operated upon apparently played no part in the incidence of suppurative.

Nasal carriers of staphylococcus aureus among the theater staff do not constitute a danger provided that masks are made impermeable to direct droplet discharge from the nose and mouth.

All of the strains of staphylococcus aureus recorded fermented mannitol and produced a coagulase for human plasma.

Skin carriers negative by ordinary swabbing tests may sometimes be detected by cultivation of the sweat from the inside of rubber gloves at the end of the operation. This method has the advantage of excluding positive results which are due to temporary superficial contamination of the skin.

The frequency of glove puncture during operation was found to be as high as 25 per cent. This was reduced to 14 per cent by precautions to avoid puncture.

The following measures were followed by disappearance of the sepsis: (a) the introduction of cellophane sheets into butter muslin masks; (b) the wearing of batiste sleeves over linen gowns to prevent the escape of skin cocci in sweat; (c) the avoidance of glove puncture during operation by special attention to operative technique; and (d) the avoidance as far as possible of direct handling of the tissues.

SAMUEL KAHN M.D.

## ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Blackfield H M and Goldman L Burns in Children *J Am M* 135 1939 112 2735

In a study of burns in children the authors found that there were three phases. The burns were treated accordingly.

**Primary phase (traumatic shock)** The identical clinical picture of traumatic or surgical shock, with loss of body heat, cold moist skin, rapid pulse and fall in the blood pressure is presented. This phase is usually transient but may be prolonged and fatal.

**Secondary phase (concentration of blood)** The hemoglobin content may be elevated as high as 209 per cent. A sustained hemoglobin content of 140

per cent is fatal because it so interferes with the functioning of the blood that it would produce failure of the circulation, the inefficient carrying of oxygen with consequent oxygen starvation of the tissues, a fall of temperature and finally suspension of vital activities. With this change there is an elevation of the non-protein nitrogen level of the blood and a lowering of the blood chlorides. In the authors' series the recognition and treatment of this condition has helped to lower the early mortality, although considerable doubt still exists as to why some patients who have been competently treated die in the first seventy-two to ninety-six hours.

**Tertiary phase (loxaemia)** Two hypotheses are considered in the cause of this phase of burns: (1) the theory of broken down protein with absorption, as promulgated by Davidson; and the theory of infection held by Underhill and Aldrich. The authors accept both theories in their therapy of this phase.

In the treatment of burns shock is always treated first and if necessary blood transfusion is given. Patients are then placed in the tannic acid bath of Wells (at from 90 to 100 F) for from sixty to ninety minutes with the removal of blebs and necrotic tissue. After drying a sponge of gauze soaked in 10 per cent silver nitrate is applied to the burned areas by blotting. Immediate tanning is produced. A large cradle is then placed over the child and a temperature of from 85 to 90 F is maintained.

After the first few days the entire burned area is painted several times a day with a 1 per cent aqueous solution of gentian violet.

To prevent dehydration and blood concentration fluids are forced by mouth or parenterally. Transfusions are given in the cases of patients with extensive burns. As the eschar loosens it is trimmed away and gentian violet is applied. For those needing skin grafts preparation is accomplished by means of tub baths, saline compresses and the use of diluted azochloramide. Whenever possible the authors use the intermediate graft of Blair and Brown.

JOHN J. MALONEY M.D.

Belt T H Liver Necrosis Following Burns. Simulating the Lesions of Yellow Fever. *J Path & Bacteriol* 1939 49 493

In the cases of 4 patients who died soon after suffering extensive burns it was found at autopsy that there were evidences of a severe toxemia. Especially noteworthy were the changes in the liver. The weight varied from 1360 to 1720 gm. The parenchyma was pale and of a yellowish or ochre tint which resembled the boxwood color said to be characteristic of the liver in yellow fever. Histologically there was widespread necrosis which produced a marked disorganization of the paren-

**chyma** The liver cords were jumbled and the sinusoids distorted, but the lobular markings remained distinct because, as a rule, the cells around the portal areas and the central veins were well preserved, i.e., the necrosis was mid zonal. It consisted of hyalinization and fragmentation of the liver cells. It was not a liquefactive necrosis nor was it accompanied by more than slight polymorphonuclear reaction. It involved the cells somewhat unevenly sparing some altogether, and affecting others only in part. There was an associated fatty change of moderate degree which gave the cytoplasm a rather moth eaten appearance.

Councilman bodies were much in evidence. These are somewhat like Negri bodies but larger. They appear as rounded condensations of cytoplasm and range from about 10 to 25 millimicrons in diameter in stained sections. They are hyalinized, deeply eosinophilic, vacuolated, and surrounded by a clear zone. The larger of them sometimes contain pyknotic nuclear remnants and appear to represent whole cells, but the smaller bodies frequently lie within cells like cytoplasmic inclusion bodies.

Nuclear inclusion bodies of the type described as Class A by Cowdry (1934) were a prominent feature in all 4 livers. They correspond closely with yellow fever inclusions from which they are morphologically indistinguishable.

On the basis of the present study it appears that toxemia in certain cases of burns produces an effect upon the liver which is similar to that observed in certain virus diseases, and suggests that the noxious agent in both instances may be of a similar character. The present findings are indistinguishable from those occurring in yellow fever.

MANUEL E. LICHTENSTEIN, M.D.

## ANESTHESIA

**Christophe, L.** Clinical Experience with Different Anesthetics (Experience clinique des diverses anesthésies). *Anest. et anal.* 1939 5 11

Christophe states that of 12,000 operations, approximately 2,500 were done with nitrogen protoxide, 1,500 with sodium evipan, and the rest with ether and local or regional anesthesia. spinal anesthesia and avertin alone were rarely used.

On the basis of his experience he concludes that chloroform should never be used, and spinal anesthesia only rarely. Ether is the most important anesthetic so far, but with continued experience it may gradually lose this prestige in favor of evipan given intravenously. Such anesthetics as nitrogen protoxide, ethylene or cyclopropane have become less necessary as evipan anesthesia has developed. However, the author has found that nitrogen protoxide given by the intratracheal method under pressure is of definite value in intrathoracic operations.

Intravenous anesthesia, the author believes will become of increasing importance and tend to displace the use of other anesthetics in the great majority of cases. Very likely a better intravenous anes-

thetic than evipan may be found, but at present Christophe has found it one of the most satisfactory anesthetics at his disposal. The technique of its administration demands careful study and attention to each detail. The surgeon must understand the use of this anesthetic and direct the anesthetist as to when and how much to inject as the operation proceeds. The first injection of evipan must be given slowly, but not with the extreme slowness advocated by some surgeons. The initial dose varies from 1 to 4 c.c. according to the age and condition of the patient, only young men in good general condition require the larger dose. When the patient is asleep his reaction to pinching the skin with a small forceps should be determined, if there is a reaction, another 2 c.c. of evipan should be given, and the surgeon should wait at least three minutes before beginning the incision. Further injections of from 1 to 2 c.c. of evipan may be given as the surgeon deems necessary for the maintenance of the degree of anesthesia desired. The only absolute contraindications to the use of evipan are buccopharyngeal infections and jaundice. Otherwise evipan may be used to advantage in all types of operations. The author never saw a serious complication from the use of evipan and never used artificial respiration in the 1,500 operations done under this anesthetic.

Alice M. Meyers

## SURGICAL INSTRUMENTS AND APPARATUS

**Bates, R. R.** Studies on the Absorbability of Catgut. *Am. J. Surg.* 1939 43 702

Catgut is the most popular suture material but there exists a wide variance in opinion as to the type and size of catgut to be used for any given purpose. An experimental study was undertaken to evaluate the size and type of catgut that caused the least inflammatory reaction in the tissues yet remained long enough for holding purposes and did not interfere with proper healing.

The various sizes and types of catgut were used to suture gastro enterostomies and abdominal wounds in adult dogs. The sutured structures were examined grossly and histologically at intervals of one, four, seven, fourteen, and twenty eight days. Plain and chromic catgut sutures were used in sizes 000, 1, and 3.

It was found on the one hand that plain catgut excited a prompt and violent exudative reaction and delayed the appearance of fibroblasts. Furthermore, the large sizes of plain catgut were absorbed practically as fast as the small size and none of the plain catgut lasted more than four days. On the other hand chromic catgut in all sizes produced comparatively little tissue reaction, and fibroblasts appeared early (four days). Small chromic catgut functioned as long as or longer than the large sizes, and wound support and healing were more satisfactory when 000 chromic catgut was used. The findings were essentially the same in the abdominal wall as in the gastro intestinal tract.

LUTHER H. WOLFF, M.D.

Taylor F W Surgical knots and Sutures *Surgery*  
1939 5 493

The surgical knot is one of the more fundamental elements of surgery and until recently the scientific approach to the knot problem has been neglected. The author by experimental methods has demonstrated a number of interesting phenomena with regard to knots particularly knots which are subjected to tension. The knot is the weakest point of a suture not only because of the possibility of a defective knot but also because the tying of a knot tends to weaken fibers in the material adjacent to it.

The holding power of a knot is largely dependent upon the friction of one suture strand upon another. A coefficient of friction values for the various types of suture both wet and dry was determined. As one would anticipate the serum proof sutures such as silk worm gut, dermal and wax impregnated silk generally had the lower friction values and were little affected by wetting. Ordinary braided silk, linen and plain and chromic catgut however showed a marked increase in friction values when wet. In spite of the increased friction value of wet catgut it is a matter of common observation that wet catgut is more slippery than dry and knots tied with wet catgut have a greater tendency to slip out. The author gives two explanations for this apparent paradox: (1) wet catgut stretches and prevents the tying of hard knots and (2) wet catgut especially the boilable type swells as it takes up moisture and the knot tends to loosen as a result of this swelling. The author favors the smaller sizes of suture material since the strands can be tied more tightly together.

What type of knot is the most reliable? The author tested the various types of suture material by means of a knot testing apparatus and also by tying knots under regulated tension and arrived at some interesting conclusions. A carefully made square knot is reliable only when using ordinary silk or linen. A surgeon's knot is definitely less reliable than a square knot, a third throw being imperative when this knot is used. A triple throw knot is the safest of all simple knots but at least 2 of the throws should be square. Frequently square knots tied with one hand are not pulled down flat and as a result are useless. If differences in bulk occur (such as those present when 2 strands are tied to a single strand at the end of a running suture) or if one component is less pliable than the other it is very difficult to tie a flat square knot hence a quadruple throw knot is recommended when wet catgut or waxed silk is being used. The cut ends of a knot should be left fairly long because of the tendency of knots to slip a bit or roll. Catgut suture ends should be left at least 6 mm long and suture ends of silk (small size) should be 3 mm long. Knots tied with chromic catgut are definitely more secure than those tied with plain catgut. Serum proof silk although exceptionally satisfactory in many respects has the disadvantage of being particularly prone to knot slips because of its low friction value. Extreme care must be used in tying this material.

The personal element of the operator himself is a factor in knot reliability and the author advises that particular caution must be taken with all knots subject to stress. LUTHER H WOLFF MD

# PHYSICOCHEMICAL METHODS IN SURGERY

## ROENTGENOLOGY

Newcomer, N B The Joint Changes in Hemophilia *Radiology* 1939 32 573

The recognition of hemophilia as a cause of joint changes is stressed. It is of great importance that the profession be reminded that approximately 80 per cent of hemophiliacs have significant articular abnormalities which are due to the disease.

The literature on hemophilia is carefully reviewed. Some authors have attempted to classify the joint involvement in several stages but it would appear that the author's two stage classification viz (1) the stage of acute hemorrhage into the joint and (2) the chronic stage in which changes in the joint are produced by these hemorrhages, is highly practical. Thomas in a review of 98 cases of hemophilia, found that 78.5 per cent of the patients gave a history of joint involvement while 61.2 per cent had permanent joint deformity. Of the joints involved, the knee was by far the most commonly affected (in

68 per cent). The order of frequency of involvement of other joints was ankle, 56, elbow 53, hip 16, fingers 15, wrist, 5, and toes, 2 per cent. The shoulder more than any other joint seemed to have escaped permanent deformity. The spine was involved in 3 cases. The appearance of the joints varies according to the stage of the disease. In the hip, Perthes' disease may be simulated. In general the picture varies from periarthritic swelling due to hemorrhage to an appearance of osteoarthritis withipping of articular margins, bony osteophytes due to destruction of articular cartilage, limitation of motion in varying degrees, and regional muscular atrophy. Bone destruction may vary from punched out areas in the epiphysis without disturbance of the articular surfaces to destruction of the articular surface with localized rounded areas of destruction extending into the epiphysis. Organization of blood clots may be shown by calcification.

Three cases were reported in some detail. The first that of a male of sixteen had given evidence of

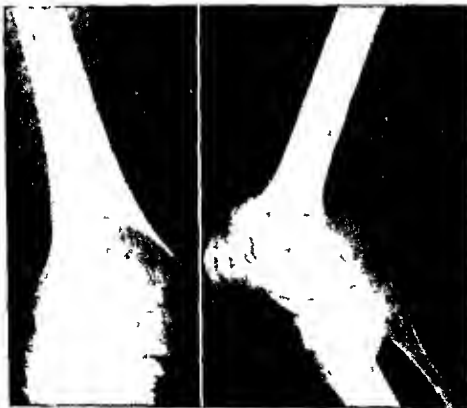


Fig 1

Fig 2

Figs 1 and 2 Anteroposterior and lateral views of the left knee. There is a widened and deepened intercondylar notch, a punched out area above the external condyle, flattening of both tubercles of the spine of the tibia and irregularity of the articular surface of the internal tuberosity. There is rarefaction of both condyles of the femur and a small osteostoma on the anterior surface. There is rarefaction of both tuberosities and of the patella.

hemophilia since the eleventh day of life. Joint symptoms appeared at the age of five when the joints of the right arm became involved. At the time of examination roentgenologically demonstrable lesions were found in the left elbow, wrist and hand, the right wrist and the left knee. The second patient, a male of fifty six, had had episodes of bleeding since infancy and presented demonstrable changes in the right knee and in both ankles as well as in the right elbow. The third patient, like the 2 others, presented an excellent family and personal history of hemophilia. Joint symptoms were noted at the age of ten. Roentgen changes were found in both knees, both elbows and the right shoulder and hand. The accompanying illustration demonstrates very well the widening of the intercondylar notch, punched out areas in the lateral condyles and irregularity of the articular surfaces which were found in the radiograph of the left knee.

HAROLD C. OCHSNER, M.D.

Caldwell W. E., Moloy H. C. and Swenson P. C.  
The Use of the Roentgen Ray in Obstetrics  
*Am. J. Roentgenol.* 1939 41 305 305 779

In a series of three papers a review of the roentgen methods of study of the female pelvis and the fetal head as an aid to obstetrical prognosis has been presented. The objectives of roentgen examination are two: to determine (1) whether the bony pelvis is large enough to permit the fetal head to descend safely, and (2) how it may descend provided the pelvis is large enough to receive it. Opinions differ as to the importance of these two objectives. Some workers believe the first to be more important and consequently make use of procedures which give accurate measurements of the pelvis and fetal head. The diameters of the bony pelvis are more easily obtained by roentgen methods than are the cephalic diameters. The volumetric method proposed by Ball seems to place the estimation of head size upon an accurate basis. The sizes of the pelvis and the head being determined, however, in many cases a prognosis as to ease or difficulty of labor cannot be made with reasonable assurance for several reasons. The ability of the head to flex and mold with efficient uterine contractions and so to overcome even a major degree of disproportion cannot be estimated. Errors in prognosis may occur through the use of the smallest pelvic diameter as the index of pelvic capacity. In a few pelvises depending upon their shape the smallest diameter is the index of pelvic capacity; in others, with the same smallest diameter, an easy labor may occur because in other diameters compensatory space exists which the head may utilize. However, more experience in the interpretation of pelvic type may in the future increase the accuracy of the obstetrical prognosis as approached by means of methods which give quantitative diagnostic information.

The second prognostic objective is concerned with fetal pelvic relationships during labor and with the manner in which the head engages and descends, and

is important in all cases whether or not variable degrees of disproportion exist. Certain roentgen techniques from which accurate measurements of the pelvis and fetal head may be obtained from single anteroposterior and lateral films are not entirely satisfactory for the study of pelvic shape and fetal pelvic relationships. For this purpose stereoscopic anteroposterior films, in addition to a lateral and a subpubic arch view, have been found more satisfactory. A suitable technique for making the stereoscopic films which includes a practical modification of a stereoscopic method of measurement (the so-called phantom image method) has been developed. By means of the precision stereoscope diameters of the pelvis and fetal head may be measured accurately enough for practical purposes and the pelvic shape and fetal pelvic relationships can be studied at the same time.

To interpret the roentgenograms the roentgenologist must acquaint himself with the problems which concern the obstetrician, namely the size and shape of the maternal pelvis, the position and axis of the fetal head, and the existing degree of flexion, extension or molding. These are the factors along with the uterine and pelvic soft parts which control the mechanism of labor. It is difficult to describe rules to follow in the interpretation of the roentgenograms with regard to the manner in which the head descends. However, an attempt has been made to show how a knowledge of pelvic shape and fetal pelvic relationships may be applied to advantage in the management of labor and in the treatment of pelvic arrest.

#### CONCLUSIONS

The following conclusions seem justifiable:

(1) The study of stereoroentgenograms augmented by a lateral view and an anteroposterior view of the subpubic arch makes possible a complete description of the shape of the pelvic cavity from inlet to outlet and leads to a classification upon the basis of morphology.

(2) The size of the pelvic diameters as determined by measurement of the phantom image in the precision stereoscope and an approximate estimate of the degree of disproportion may be gained by using the image of the fetal head as the yardstick of measurement. Any other method of roentgen pelvimetry may be used including the comparison of head volume to pelvic size.

(3) The recognition of ample pelvic capacity and absence of disproportion gives negative evidence of value to the obstetrician, but such evidence does not preclude the possibility of soft part dystocia.

(4) With increasing experience the probable mechanism of labor for the pelvic type may be suggested.

(5) A knowledge of the size and shape of the pelvis and the fetal pelvic relationships aids in the management of labor by indicating the regions where the most available space exists. In certain instances this compensatory space may be made

available to the fetal head by manual or instrumental methods

(6) In the event of arrest of the fetal head, a knowledge of pelvic shape and the existing fetal pelvic relationship aids in showing how the best operative procedure may be employed

(7) Positive prognostic statements as to the outcome of labor should be avoided except in rare instances because too many immeasurable factors, which cannot be visualized by the roentgen ray are involved

(8) A roentgenological examination is useful in the teaching of the mechanism of labor to the resident and intern staff of obstetrical clinics. In the discussion of difficult individual deliveries a knowledge of the pelvic type as revealed by a roentgenological examination is necessary in order to appreciate fully the cause of the difficulty encountered

(9) The obstetrician must acquaint himself with the visual appearance of the common obstetrical difficulties with which he is familiar. The roentgenologist and obstetrician must cooperate in an effort to correlate the roentgenological and clinical data in each case to obtain more practical information from the roentgenograms

Nordentoft J M The Conservative Treatment, with Barium Enema of Intussusception in Children *Icta radiol* 1939 20 128

The treatment of intussusception in children by means of barium enemas with fluoroscopic control has been reported by various authors, but the method does not seem to have met with universal favor. With a view toward determining the certainty with which intussusceptions in children could be reduced by the roentgen method the author reviews 440 cases observed from 1928 to 1935. The procedure was employed in about half of all the cases in this group and complete reduction was obtained in about half of the cases in which it was used.

Use of the method has increased very materially whereas it was employed in only 34 per cent of the cases during the first four years of the period under investigation. 64 per cent were subjected to it during the latter four years. Study of the series revealed that nearly all cases of intussusception of the large intestine coming under treatment within the first twenty-four hours can be reduced conservatively

by the barium enema method. A careful technique with adequate constant pressure is necessary for successful results. The need for repeated roentgen examinations to determine successful reduction is stressed. The advantages and drawbacks of the roentgenological method are discussed briefly.

ADOLPH HARTUNG, M D

# MISCELLANEOUS

Hollaender A The Present Status of Mitogenetic Radiation *Radiology* 1939 32 404

Mitogenetic rays are reported to be the ultra-violet radiation of wave lengths from 1,900 to 2,600 Å of an intensity of from 10 to several thousand quanta/cm<sup>2</sup>/sec, and are said to be emitted by many biological materials and by chemical reactions. This radiation is supposed to cause increased cell division in certain biological materials to initiate or speed up certain enzymatic reactions, and to cause the emission of so called secondary radiations in many biological materials which are themselves not able to emit primary radiation.

This article is a review of a few details of the characteristics of mitogenetic radiation and the procedures in its detection and manipulation. An attempt is made to determine whether mitogenetic radiation is a well established scientific phenomenon, and if its existence can be proved by any investigator, with proper training who uses the appropriate procedures.

Detailed descriptions of the biological and physical methods reported by various workers are given. In spite of the fact that a majority of the more than 700 publications on the subject imply that the use of biological detectors is a simple, well outlined procedure which may be reproduced by anyone acquainted with fundamental biological technique the author believes that such confidence is not justified, since it ignores conflicting findings. From the results obtained with physical detectors, to date, it would appear also that the existence of mitogenetic radiation has not been proved by them. Although extensive reviews on the application of mitogenetic analysis to many biological problems are available, an evaluation of the results of the use of these methods must await further investigations.

ADOLPH HARTUNG M D



# SURGICAL CONSIDERATION OF AMEBIASIS

## Collective Review

ALTON OCHSNER M D F A C S and MICHAEL DeBAKEY M D New Orleans Louisiana

AMEBIASIS is of surgical significance because it may produce intestinal manifestations which are identical with those of other bowel lesions amenable to surgical therapy, and because extra intestinal invasion of the body by *entamoeba histolytica* may produce lesions which necessitate surgical intervention. While it is the general impression that amebiasis occurs principally in warmer climates the investigations of Craig (14) and others (61) demonstrate conclusively that amebiasis occurs ubiquitously. In a series of 40,336 persons examined in all parts of the United States as collected by Craig (14) 5,720 (11.6 per cent) were found to be infected with *entamoeba histolytica*. Craig (15) also found in examining 189 physicians from all parts of the United States *entamoeba histolytica* in 12.7 per cent. The incidence of amebiasis is increasing as evidenced by the authors' (61) analysis of collected cases. In a collected series of 19,882 individuals who were examined before 1930 there were 2,058 (10.3 per cent) with positive infection in a similarly collected group of 28,634 individuals examined since 1930 there were 3,692 (12.8 per cent) with positive infection (61). The authors estimated that between 300,000 and 600,000 people in the United States have amebic hepatic abscess. *Is hepatic abscess represents only about half of the complications of amebiasis of surgical significance it is evident that a conservative estimate would be that from 500,000 to 1,000,000 people in this country are so affected.* This appallingly high figure emphasizes the necessity of serious consideration of amebiasis by surgeons.

Amebic lesions of surgical significance may be classified as follows:

1. Intestinal lesions
  - a. Appendicitis
  - b. Perforation with resulting peritonitis
  - c. Massive hemorrhage
  - d. Ameboma (Amebic granuloma)
  - e. Cicatricial stenoses
  - f. Pseudopolyposis

2. Extra intestinal lesions
  - a. Hepatic abscess
  - b. Pleuropulmonary affections
  - c. Cerebral abscess
  - d. Cutaneous ulceration and abscess
  - e. Splenic abscess
  - f. Genito-urinary affections

### INTESTINAL LESIONS

In a previous communication (52) the surgical significance of amebic appendicitis was emphasized. *It is our belief that one of the most frequent surgical complications of amebiasis is amebic appendicitis which may occur as an acute, suppurative or chronic inflammatory process.* The lesion however is likely to be overlooked unless the physician considers the possibility of its existence. This is true particularly in low grade chronic infections in which the correct diagnosis is missed unless careful examination of the feces is made. The frequency of acute amebic inflammatory processes in the appendix is demonstrated by the investigations of Clark (12), Strong (74) and Craig (16) who obtained incidences of suppurative appendicitis in fatal cases of amebiasis of 7 per cent, 40 per cent and 16 per cent respectively. Acute infection of the appendix occurring during the course of an amebic infection of the bowel is more likely to be suspected pre-operatively than are the subacute and chronic inflammations produced by *entamoeba histolytica*. From our experience however we believe that amebic infections of the appendix producing mild symptoms are common. So frequently does this condition exist that it is a rule in our clinic to have careful stool examinations for *entamoeba histolytica* in all patients in whom a diagnosis of chronic appendicitis is made. Probably the appendiceal infection is only a part of the more or less generalized involvement of the intestinal tract. In approximately 10 per cent of these cases the parasite is found and in most instances anti amebic therapy is sufficient to bring about a relief of all symptoms and signs. Wilkin (84) believes that chronic amebiasis and chronic appendicitis may so simulate each other that they must always be differentiated. Huard (37) is of the opinion that amebic appendicitis



occurs frequently enough to deserve consideration in every patient with pain in the right iliac fossa particularly if that patient gives a history of having had an antecedent dysentery. However, the absence of a history of diarrhea in no way rules out the possibility of amebiasis, he cause, as emphasized by Craig (14), dysentery is only one manifestation of amebic invasion of the bowel and one which is not infrequently absent. Craig (14) states "It is most unfortunate that the term 'amebic dysentery' should have become in the minds of most medical men as a synonym of amebiasis or amebic infection, for while dysenteric manifestations are quite characteristic of the serious infection of *entamoeba histolytica*, the vast majority of such infections are not accompanied by dysenteric symptoms, but by milder symptoms usually attributed to some other factor and not recognized as a result of infection with the parasite."

The clinical manifestations of chronic amebic appendicitis are indistinguishable from those produced by chronic pyogenic infections of the appendix. In our experience constipation has been present far more frequently than diarrhea in both types of appendiceal involvement. In all patients with manifestations of chronic infections of the appendix in whose stools amebas are demonstrated or in whom the complement fixation test for amebiasis is positive, the use of amebicides is imperative. In subacute infections of the appendix conservative treatment is justified, although one should be cautious about the use of those amebicides which produce intestinal irritation. In such instances it is preferable to use emetine because this exerts a definite amebicidal action but does not irritate the intestine, nor increase its peristalsis.

In acute amebic appendicitis, in addition to antiamebic therapy, absolute conservatism is essential, as employed and previously described (53, 54) in the treatment of pyogenic appendiceal peritonitis. Any operative manipulation is undesirable and dangerous in acute amebic inflammations of the appendix because the infection is seldom if ever limited to the appendix but involves the cecum as well. This danger was demonstrated by the prohibitive appendectomy mortality rate which followed the Chicago epidemic. However, appendectomy is necessary occasionally.

In the rapidly progressive case of intestinal amebiasis perforation of the bowel may occur. The incidence of this complication varies considerably in clinical and autopsy series. Strong (75) found intestinal perforation in 19 per cent of fatal cases of amebiasis, whereas it was observed

in only 15 per cent of clinical cases. On the other hand, Craig (14) found the incidence in fatal cases of amebiasis to be only 4 per cent. The prognosis in most cases of amebic intestinal perforation is grave because peritonitis almost invariably follows and little or nothing can be accomplished by surgical intervention.

Although generalized peritonitis which is likely to end fatally will usually result from the perforation of an amebic ulcer into the free peritoneal cavity, localized peritoneal infections with the development of walled off peritoneal abscesses occur more frequently, particularly in the regions of the cecum and the sigmoid. In contrast to chronic intestinal amebiasis in which constipation is usually present, in these cases dysentery is often a prominent manifestation, although as Craig (14) has emphasized, there may be a history of repeated diarrheal attacks. As the condition is localized, surgical intervention is not urgent and amebicides (emetine) should be used as a preliminary measure. Following the preoperative administration of amebicides, incision and drainage of the abscess is indicated without prolonged delay in order to prevent possible perforation of the abscess into adjacent viscera, into the free peritoneal cavity, and into the extraperitoneal areas.

Massive intestinal hemorrhage is a rare complication of amebiasis. Strong (76) reports 2 cases in which intestinal hemorrhage was a fatal complication. Craig (14) refers to 2 cases in which hemorrhage was the cause of death in the recent Chicago epidemic. Treatment of massive intestinal hemorrhage should be ultraconservative and consists of the use of amebicides, and massive and repeated transfusions in order to replace the lost blood and to increase the blood coagulability. In massive hemorrhages the mortality is extremely high.

Infrequently, as a result of repeated invasion of the bowel wall by the amebas with consequent fibrous tissue reaction, tumefaction occurs. The growth has been referred to as amebic granuloma, but in the authors' opinion 'ameboma' is preferable and more expedient. Cases of this nature have been reported by a number of authors (3, 5, 23, 30, 31, 39, 42, 78). 'Amebomas' are most likely to occur in the cecum or in the sigmoid and are characterized by progressive destruction of the bowel wall and replacement with fibrous tissue. Small abscesses may be present in the more central areas. The firm, nodular inflammatory mass is usually fixed to adjacent structures by fibrous tissue surrounding the tumor. The mucous membrane is largely destroyed and the base of

the resulting ulcer is covered with dirty grayish slough. Microscopically amebas are demonstrable particularly in the necrotic tissue at the base of the ulcer. There is considerable round cell infiltration and lymphoid hyperplasia. Eosinophiles are present in large numbers. Fibroblastic proliferation becomes more prominent in the peripheral portions of the mass. Amebomas are likely to be confused with tuberculomas and actinomycotic and malignant lesions. In all chronic inflammatory lesions involving the cecum particularly one should consider the possibility of ameboma and attempt to exclude it by careful stool and serological examinations. In those cases in which amebas are found the use of amebicides is imperative before any surgical intervention is done. In many cases because of extensive cicatricial narrowing consequent to healing short circuiting operations or resections may be necessary to restore normal bowel function. If the active amebiasis has not been controlled before such a procedure is attempted extension of the amebic infection to the peritoneum or the abdominal wall is quite likely to occur postoperatively.

Cicatricial stenoses of the colon may occur either locally in a particular segment or throughout the entire extent of the bowel. Craig (14) has called attention to the fact that at post mortem occasionally a generalized narrowing of the colon may be found. Particularly in patients who have had symptoms over long periods of time with recurrent infection is cicatricial narrowing of the bowel likely to occur the result of destruction of the bowel wall and replacement by fibrous tissue. Probably the reason that more stenoses do not occur is that the lesion in amebiasis is limited characteristically to relatively discrete areas of mucosa and submucosa. In those instances in which cicatricial narrowing does occur it is probably the associated secondary infection engrafted upon the amebic infection which is responsible for greater destruction of the bowel wall. Recently Christopher (10) reported a case of extensive cicatricial narrowing of the large bowel extending from the cecum to the sigmoid which was successfully treated by multiple stage resection of the bowel. It is of interest that the patient's first symptoms were those of ameboma involving the cecum. Exploration of the abdomen revealed a localized abscess above the ileocecal valve and also a large inflammatory mass involving the cecum. In the purulent discharge from the abscess amebas were found. The treatment of amebic cicatricial stenoses of the bowel consists first of the administration of amebicides in those

cases in which the amebic nature of the condition is established and later either excision of the stenotic bowel or short circuiting around the stenotic obstructed area. A case of ameboma treated successfully by the use of amebicides has recently been reported by Uzac and Tumbal (81). The tumor in this instance involved the recto-sigmoid. Rarely such structures may be limited to the rectum. Travassos (80) was able to find only 2 proved reported cases and added 2 of his own. In rectal strictures careful dilatation of the stricture is justified.

As a result of the long continued infection hypertrophy of the colonic mucosa may occur and result in pseudopolyposis of the bowel. Hines (36) and Anderson *et al* (1) report cases in which following prolonged amebic infection there resulted pseudopolyposis of the entire colon. Anderson's (1) patient recovered following a two-stage resection of the large bowel.

#### EXTRA INTESTINAL LESIONS

From a surgical therapeutic standpoint the most important amebic lesion is hepatic abscess. In previous studies (61) the authors found that of 4,994 fatal cases of amebiasis collected from the literature 1,818 (36.5 per cent) presented hepatic abscess. The lowest incidence in this group was 7.6 per cent (11) and the highest was 84.4 per cent (73). The incidence of hepatic abscess in all cases of amebic dysentery varies considerably. In a group of 9,039 collected cases of amebiasis including the authors there were 4,030 cases of amebic abscess of the liver an incidence of 47 per cent (61). In the Charty Hospital group of the authors series there were 118 amebic hepatic abscesses among 676 cases of amebic dysentery an incidence of 17.4 per cent. Curiously enough the incidence has increased during the past few years in this institution. During the six year period from 1928 to 1933, inclusive the incidence of hepatic abscess in amebic dysentery was 15.2 per cent (55) whereas in the period from 1934 to 1937 inclusive this figure was 30.4 per cent (61). This recent increase in incidence is due either to the fact that more cases are being diagnosed or to the actual increase in liver complications. Undoubtedly as Craig (14) has emphasized many cases remain undiagnosed especially in temperate climates where amebiasis is still considered a tropical disease. Craig has on numerous occasions found an amebic abscess of the liver at autopsy which was absolutely unsuspected before death.

Amebic hepatic abscess occurs predominantly in males. In a series of 1,487 collected cases the

authors found that 1,418 (95.3 per cent) occurred in males. In the authors' series of 139 cases there were 119 (85.4 per cent) in the male sex. There are several factors that are responsible for the greater incidence of amebic hepatic abscess in the male. The fact that amebic infection of the bowel occurs more frequently in the male predisposes to the development of hepatic infection. Rolleston (71) has suggested that this is explained by the greater incidence of alcoholism which predisposes to hepatitis and the greater likelihood of trauma in the male.

Amebic hepatic abscess is a condition of adult life, most of the cases occurring between twenty and fifty years of age. In the authors' series of 139 cases 17.9 per cent occurred in the third decade, 29.4 per cent in the fourth, and 25.8 per cent in the fifth decade. The youngest patient was six years and the oldest was seventy years, the average age being about forty years. Over 55 per cent of the cases occurred between the ages of thirty and fifty. It is of interest that the average age in our series is approximately a decade older than in the tropical cases, which is probably due to the fact that in the tropics amebiasis occurs more frequently and in younger individuals. There was little difference in the racial incidence in our series. Of 118 cases admitted to the Charity Hospital 50.8 per cent occurred in white and 49.1 per cent in colored patients.

Amebic hepatic abscess is the result of the invasion of the liver parenchyma by amebas following their transportation from the colon through the portal system. It is our opinion that because many cases of hepatic abscess are unassociated with diarrheal manifestations, lesions of the right side of the colon are more likely to give rise to amebic hepatic abscess than those on the left side, probably because of the fact that lesions on the left side produce dysenteric manifestations which direct the attentions of the patient and the physician toward the bowel lesion and result in the institution of adequate therapy of the amebic intestinal infection. In those instances in which the infection is limited to the right side of the colon, the intestinal lesion is likely to be silent and permit invasion of the portal system by the amebas and extension to the liver without the true diagnosis being suspected. Following invasion of the hepatic parenchyma by amebas there results an amebic hepatitis which if allowed to progress may produce liquefaction necrosis of the parenchyma. According to Craig (14), amebas exert a lytic action on liver cells. The condition is in reality not a true abscess but a liquefaction necrosis. If prompt therapy is instituted during

the stage of amebic hepatitis no destruction will occur and complete restitution will be obtained.

The majority of amebic abscesses of the liver are single. In 1,403 cases the authors (61) found that 68.6 per cent were single and 31.3 per cent were multiple. In 99 of the authors' personal cases, 87.8 per cent were single and 12.1 per cent were multiple. The right lobe is more frequently involved than the left. In the collected series the right lobe was involved in 83.8 per cent and the left in 16.1 per cent, in the authors' personal series these percentages were 95.9 per cent and 4 per cent, respectively. The content of an amebic abscess consists of necrotic liver tissue which accounts for the characteristic chocolate sauce appearance of the material obtained from such an abscess. Amebas are seldom present in the liquefied material, but are frequently present in the wall. In 289 collected cases amebas were present in the pus in only 16.9 per cent. In 77 personal cases amebas were present in the pus in only 15.5 per cent. Most amebic abscesses of the liver are sterile, as shown by an analysis of 448 collected cases in which the abscess was found to be sterile in 86.3 per cent. In 77 personal cases the abscess was sterile in 84.5 per cent. While the amebic hepatic abscesses are usually sterile, they quickly become infected after open drainage, the significance of which will be discussed under therapy.

The clinical manifestations of amebic hepatic abscess may be divided into two groups: systemic and local. In contrast to pyogenic abscess of the liver the symptoms and signs are less clearly defined than one would expect from the degree of hepatic destruction. By far the most frequently encountered clinical manifestations are pain in the right upper quadrant of the abdomen and tenderness over the liver. In our series these manifestations were present in 85 per cent. So convinced are we of the importance of right upper abdominal pain that we believe that in every patient with this manifestation with hepatic enlargement the possibility of amebic hepatitis should be considered and excluded. Fever is almost as frequently encountered, in 83 per cent in our series. Characteristically, pyrexia is not marked. The usual range is from 99 to 101 degrees F. unless secondary infection of the abscess occurs. Enlargement of the liver was present in 72 per cent of our cases. Weakness and loss of weight were the next most frequently encountered symptoms, being present in 52.5 and 42.4 per cent respectively. Diarrhea was a manifestation at the time of admission to the hospital in only 21.5 per cent, which demonstrates the danger of placing too much importance on dysentery as a symptom in

amebic hepatic abscess. Chills were present in 17 per cent, nausea and vomiting in 15.7 per cent and jaundice in only 7.8 per cent. Of diagnostic significance is the fact that a patient with an uncomplicated amebic hepatic abscess does not appear to be acutely ill. He has the appearance of one who has a low grade infection which has been present for some time. This is in direct contrast to the clinical appearance of a patient with a pyogenic hepatic abscess. In addition to the local manifestations such as liver tenderness and enlargement of the liver there is frequently localized bulging at the site of the abscess. This is likely to occur particularly on the right side just beneath the costal margin. The clinical manifestations vary in different cases. We have arbitrarily divided the cases into two groups: those with symptoms that have existed less than three weeks have been considered acute abscesses whereas those with symptoms that have existed three weeks or longer have been considered chronic abscesses. Of 66 cases in which the duration could be determined one third were acute and two thirds were chronic. The average duration in the acute cases was thirteen days and that in the chronic one hundred and thirty three days.

The laboratory findings in amebic hepatic abscess are significant because they differ so from those of pyogenic liver abscess (62). The authors' findings (22, 55, 56, 61) agreed with those of Rogers (67, 68, 69), and Manson Bahr and Wiloughby (45) in that the increase in the polymorphonuclear leucocytes was only moderate and that there was not the disproportionate increase in the polymorphonuclear leucocyte count that is found in pyogenic hepatic abscesses. In our series (61) the lowest leucocyte count was 4,250 the highest 31,500. The neutrophilic percentages were as follows: lowest 59, highest 97 and the average 78. A considerable elevation of the total leucocyte count associated with a marked increase in the polymorphonuclear percentage indicates secondary infection of the abscess cavity. The lowest erythrocytic count was 1,950,000 the highest 4,975,000 and the average, 3,700,000. The corresponding hemoglobin percentages were 35, 90 and 65. In all suspected cases of amebic hepatic abscess careful repeated stool examinations should be made. Although the presence of *Entamoeba histolytica* in the stool is of diagnostic importance its absence in no way excludes the diagnosis of amebic hepatic abscess. This undoubtedly is due to the fact that the antecedent intestinal infection is healed after invasion of the liver has occurred. In the collected series of 209 cases of amebic hepatic abscess the stools were

positive in only 18.1 per cent whereas in the authors' 72 cases amebas were found in the stools in 30.5 per cent.

Of great diagnostic value in amebic hepatic abscess is the complement fixation test of Craig (17, 18). This test was positive in every case of proved amebic hepatic abscess in which it was used.

One of the most important and reliable aids in the diagnosis of liver abscess is roentgenography. With few exceptions the characteristic manifestations of hepatic abscess as described by Granger (29) and the authors (57) have been present in our series. These consist of a localized bulging of the diaphragm into the lower lung field in uncomplicated hepatic abscess. In those cases in which amebic hepatic abscess has ruptured into the subphrenic space there is characteristically an obliteration of the cardiophrenic angle that is elevation of the medial portion of the diaphragm in anterior posterior roentgenograms and obliteration of the anterior costophrenic angle in lateral roentgenograms. This is because of the medial and anterior locations of the abscess in the subphrenic space. The anteromedial location of these collections of fluid characteristically is different from that of pyogenic infections which is posterior and lateral (58). Roentgenograms of the latter infections show elevation of the diaphragm in the lateral portion and obliteration of the costophrenic angle rather than the cardiophrenic angle in anterior posterior roentgenograms and obliteration of the posterior rather than the anterior costophrenic angle in lateral roentgenograms. The diagnostic importance of roentgenographic examination is illustrated by the percentages of correct diagnoses. In the collected series the x-ray findings were positive in 83.3 per cent in our own series this percentage was 88.5 (61).

The diagnosis of amebic hepatic abscess is not difficult if the physician will merely consider the possibility of its existence. Probably the most important reason that a correct diagnosis is not made is that many physicians still consider amebiasis as a tropical disease do not sufficiently realize the ubiquitous distribution of this infection and are not cognizant that amebic hepatic abscess can occur in the absence of diarrhea. In a patient with persistent enlargement of the liver associated with slight pyrexia one should always consider the possibility of amebic hepatic infection. The presence of a moderate leucocytosis without a concomitant proportionate increase in the polymorphonuclear leucocytes is of diagnostic importance. A history of previous diarrhea is confirmatory but was present in only two-thirds of

our cases. The fact that only 1 of 5 of our patients had diarrhea at the time of admission is dramatic proof that concomitant diarrhea is unnecessary for the diagnosis of amebic hepatic abscess. In addition to the clinical history, the classical roentgenographic findings and positive complement fixation test are the most important diagnostic aids. The presence of a positive complement fixation test is evidence of an amebic infection, and in a patient with hepatic enlargement is indicative of amebic hepatitis which may or may not have progressed to abscess formation. Probably of greatest diagnostic importance is exploratory aspiration of the abscess. As in 84.5 per cent the aspirated material was sterile, the site of aspiration might seem of little consequence. Because, however, 15 per cent of the cases showed the presence of pyogenic microorganisms, we believe that aspiration should be done in such a way as to prevent possible contamination of uninvolved serous cavities. We believe, too, that the aspiration should be done in the operating room, because in those cases in which pyogenic organisms can be demonstrated, which usually can be suspected before the aspiration by the marked pyrexia and leucocytosis, open drainage should be done. In abscesses located posteriorly the needle should be introduced below the costophrenic angle and directed upward toward the abscess. In order to prevent possible contamination the pleural cavity should not be traversed by the needle. Anteriorly located abscesses are approached beneath the costal margin, the needle being introduced directly into the abscess. Aspiration of characteristic chocolate sauce pus is of diagnostic importance, and is considered almost pathognomonic of amebic hepatic abscess. As mentioned, smears of the aspirated material should be examined in the operating room to determine the presence or absence of pyogenic organisms. Cultures should always be made.

The prognosis in amebic abscess of the liver depends upon a number of factors: (1) multiplicity of the lesions in the liver, which in turn are dependent upon the severity of the amebic infection; (2) general resistance of the patient; (3) secondary infection of the abscess cavity; and (4) the type of treatment employed. The gravity of the multiplicity of lesions is apparent in our statistics. In 12 cases in which the amebic hepatic abscesses were multiple the mortality rate was 100 per cent, whereas in 87 cases in which the abscess was single the mortality rate was 11.4 per cent. Secondary infection of amebic hepatic abscess greatly increases the gravity of the con-

dition. This is well illustrated by those cases in which secondary infection of the amebic abscess follows open drainage. The patient does not appear ill before the institution of open drainage, he has a temperature ranging between 99 and 101° F and a leucocyte count of approximately 13,000, however following the institution of open drainage he appears to be acutely ill, his temperature rises to 104 or 105° F, and the leucocyte count increases to 20,000 or 30,000. This observation is substantiated by the results obtained following open and closed drainage (61). In 4,760 collected cases in which open operation was done, the mortality rate was 44.2 per cent, whereas in 457 similar cases in which aspiration and amebicides were used, the mortality rate was 6.7 per cent. These respective figures in our own series were 21.6 per cent and 3.6 per cent. Complications of amebic hepatic abscess which consist largely of infection, completely alter the prognosis. In our series the mortality rate in 33 cases with complications was 39.4 per cent, whereas in 106 cases with no complications the mortality rate was 8.4 per cent.

The prognosis in amebic hepatic abscess is also dependent upon the type of therapy instituted. As indicated above, the mortality rate is much lower in those cases in which aspiration and amebicides are used than in those treated by open operation. Whenever secondary infection occurs, open drainage of the abscess is necessary. In such cases the prognosis is influenced considerably by the type of drainage and is clearly demonstrated by the results obtained in the authors' cases. In 23 cases in which transpleural drainage was used, the mortality was 30.4 per cent. In 23 cases in which transperitoneal drainage was used, the mortality was 21.7 per cent. In 17 cases in which incision and drainage directly over the abscess was done, the mortality was 17.6 per cent, whereas in 11 cases in which extraserous drainage was done without contamination of an uninvolved serous cavity the mortality rate was only 9 per cent.

Until recently the treatment of amebic hepatic abscess in the United States has been very unsatisfactory. Although Rogers (67), in 1902, demonstrated that the pus in amebic hepatic abscess is sterile, the significance of this finding even to day is not sufficiently appreciated by most physicians. Rogers (70) found prior to 1907, in a fourteen year period before the introduction of ipecac, that in 2,661 reported cases of amebic abscess there was a mortality rate of 56.8 per cent. These patients were all treated by open drainage of the abscess. In contrast to these

figures are the results obtained in a similar series of cases in which ipecac and closed drainage were used. In 111 cases there were 16 deaths a mortality rate of 14.4 per cent. The open drainage of a non secondarily infected amebic hepatic abscess is just as illogical as is the open drainage of a sterile tuberculous abscess. This statement is substantiated by the complications which occur subsequent to open drainage. As mentioned, a patient with a non infected amebic hepatic abscess who does not appear ill and whose laboratory findings indicate a relatively mild infection almost invariably becomes critically ill following the institution of open drainage. If he is able to survive the results of the operation his convalescence is at best markedly prolonged. In addition to the possibility of his convalescence being prolonged his chances of recovery are about one seventh as great as they would be if closed drainage of the abscess had been used. In the 4760 collected cases in which open drainage was done the mortality rate was 44.2 per cent whereas in 437 collected cases in which aspiration of the abscess and amebicides were used the mortality rate was 6.7 per cent. This relative relationship is also substantiated by the Charity Hospital and Touro Infirmary cases. Whereas the mortality rate in those treated by open operation was 21.6 per cent that in those treated by aspiration and emetine was only 3.6 per cent. Every case of suspected amebic abscess should be given a course of emetine before any other procedure is used unless there is apparent danger of rupture of the abscess. Generally emetine is administered hypodermically in 1 grain (66 gm) doses daily for four days before aspiration. Frequently in small abscesses no further therapy will be necessary. The emetine administration should be continued in similar doses after aspiration until a total of from 6 to 10 gr have been given. According to Leake (43) the amount of emetine administered over any given period of time should not exceed 10 mgm per kgm of body weight. An approximate dose for a person weighing 150 lb would be 10 gr. Emetine should be used cautiously because as shown by Rinehart and Anderson (66) working in Leake's laboratory it produces in the experimental animal serious injury to the cardiac muscle. The lesion found in the heart is quite similar to the Aschoff reaction of acute rheumatic fever. Leake (44) is of the opinion that although other amebicides actarson, carbosone, treparsol, chinofon and vioform are safer and more efficient in the treatment of intestinal amebiasis they should not be used in amebic hepatitis and liver abscess as they themselves are toxic to the

liver. The technique of aspiration depends considerably upon the physical findings. In those instances in which there are localizing signs and pointing of the abscess the aspirating needle should be introduced directly over the mass. In order to prevent secondary contamination of the abscess cavity strict asepsis is essential which is obtained best in the operating room. Another important reason for performing the aspiration in the operating room is the necessity of immediate open drainage of the abscess in which secondary infection is found. If no localizing signs are present multiple aspirations may be necessary. In these cases it is imperative that the needle be introduced in such a way that the pleural and peritoneal cavities are not traversed. This can be accomplished by introducing the needle in the tenth intercostal space in the anterior axillary line and directing it upward, medially, and backward. Occasionally an abscess can be entered by inserting the needle below the twelfth rib and introducing it upward and anteriorly. If multiple aspirations are done it is important to remove the needle entirely before re-introducing it rather than changing the direction of the needle at the original site. In this way extensive injury to the liver will be obviated. Local analgesia is preferable to general anesthesia. Generally a 14 gauge needle is used until pus is obtained. After pus has been obtained it is frequently necessary to introduce a larger needle or even a trocar because difficulty may be encountered in emptying the abscess cavity because of the extreme thickness of the contents. As much of the liquefied necrotic material should be removed as possible in order to minimize absorption of the material. An immediate smear and culture of the pus should be made. If a large number of pyogenic organisms are found in the smear open drainage of the abscess is necessary because in such cases the secondary infection is more important than the original sterile amebic abscess. In those cases in which because of secondary infection operation becomes necessary it is imperative that the operative procedure be formed in such a way that an uninvolved serous cavity does not become contaminated. This is best accomplished by draining the abscess extra-serously (58, 63). The importance of extracapsular drainage of amebic hepatic abscess which is secondarily infected is illustrated by the mortality rate obtained by the various operative procedures in our series. In 23 cases in which a transpleural drainage was done the mortality rate was 30.4 per cent. In 23 cases with transperitoneal drainage it was 21.7 per cent. In 17 cases with incision and drainage directly over the abscess it was 17.6 per

cent, whereas in 11 cases with extraserous drainage it was only 9 per cent

Involvement of the respiratory tract by amebiasis is of surgical importance and, with few exceptions, is the result of extension of an amebic process from the liver into the thorax. Several years ago we (59) analyzed 15 cases of pulmonary complications of amebiasis admitted to the Charity Hospital and 153 collected cases. In a series of 2,490 reported amebic hepatic abscesses pleural complications occurred in 198 (7.5 per cent) and pulmonary complications in 209 (8.3 per cent), which gave a combined incidence of pleuropulmonary complications in the reported cases of 15.8 per cent. Of 95 consecutive cases of amebic hepatic abscess admitted to the Charity Hospital and the Touro Infirmary in New Orleans, 15.7 per cent had pleuropulmonary complications. In 7 (7.3 per cent) the hepatic abscess perforated into the lung, in 5 (5.2 per cent) into the pleura, and in 3 (3.1 per cent) there was a bronchopleural fistula. Since this report we (60) have had 6 additional cases making a total of 21 cases, of which 9 perforated into the lung, 5 into a bronchus, and 7 into the pleural cavity. These complications are most likely to occur in the third and fourth decades of life. Only 3.2 per cent of the collected cases were in the second decade, 38 per cent in the third, 25 per cent in the fourth, 38 per cent in the fifth, 7.5 per cent in the sixth, and 2.1 per cent in the seventh decade. In our series the majority of patients were approximately two decades older than in the collected series. These complications are more likely to occur in males (96.2 per cent in the collected series). In our original series (59) there were 14 males and 1 female. This is undoubtedly due to the fact that amebic hepatic abscess occurs more frequently in the male. Of our 15 patients 9 were white and 6 were colored. Amebic invasion of the respiratory system is usually the result of extension from amebic hepatic abscesses. Occasionally, however, pulmonary metastatic lesions resulting from invasion of the systemic circulation can occur. It is doubtful whether primary infection of the lung without an antecedent infection of the bowel ever occurs. Panajatalou and Netter (64) described a case which they considered primary amebic bronchitis. Similar cases were recorded by Petzetakis (65), Haberfeld (32), and others (66). Although these cases were considered to be primary in the respiratory tract by the respective authors, it is probable that most if not all pleuropulmonary lesions are the result of perforation of amebic hepatic abscess into the pleural cavity, the lung parenchyma, or into a bronchus.

From an analysis of our own and collected cases we have divided pleuropulmonary amebic infections into five different groups, which are based upon the type of involvement: (1) hematogenous pulmonary abscess without liver involvement, (2) hematogenous pulmonary abscess and independent liver involvement, (3) pulmonary abscess extending from a liver abscess, (4) bronchohepatic fistula with little pulmonary involvement, and (5) empyema extending from a liver abscess. The respective incidences of these types of involvement in the collected series were 14.3 per cent, 10.4 per cent, 37.2 per cent, 19.6 per cent, and 17.6 per cent.

The clinical manifestations of amebic infections of the lung and pleura vary according to the extent and the mode of infection. In those cases in which infection extends from a liver abscess the first manifestation is usually severe pain in the lower portion of the chest on the right side. This is due to involvement of the diaphragmatic pleura by the inflammatory process. A persistent unproductive cough is a prominent symptom. In those cases in which there is a communication with the bronchus, expectoration of large quantities of chocolate sputum occurs. Dyspnea is present in those cases in which there is encroachment upon a considerable portion of the lung field. In the collected series the chief complaints were as follows: cough and expectoration in 64.9 per cent, fever in 17.9 per cent, pain in the chest in 15.6 per cent, pain in the right upper quadrant in 11 per cent, diarrhea in 9.5 per cent, and pain in the shoulder in 2.9 per cent. Aside from the chief complaints, 92.5 per cent of the patients complained of cough and expectoration, 43.2 per cent of fever, 41 per cent of previous diarrhea, 39.7 per cent of an enlarged liver, and 31.3 per cent of chest pain. In our cases in which there was a communication with the bronchus there was a positive history of expectoration of chocolate sputum in every instance. The physical findings vary considerably and are dependent upon the degree and extent of the pulmonary involvement. In the majority of instances the liver is enlarged and tender. As in amebic infections of the liver, the temperature is characteristically not high. In our series the highest temperature was 103°. In the majority of cases it ranged between 100° and 101°F. As in amebic hepatic abscess the leucocyte count is only moderately increased although the increase is greater than in hepatic infections. In the collected cases the highest leucocyte count was 52,000, the lowest 9,700, and the average 18,860. The highest polymorphonuclear leucocyte count was 91 per cent, the lowest 53 per cent, and

the average 72.8 per cent. In our series these respective figures were 51.250, 7.500 and 17.000 and 92 per cent, 70 per cent and 79 per cent. In cases in which there have been recent perforations into the bronchus amebas can usually be demonstrated in the sputum. In the collected cases the sputum was positive for amebas in 79.1 per cent.

In those cases in which perforation of an amebic hepatic abscess into the lung has occurred x-ray findings are characteristic. Prior to perforation the liver abscess produces a localized bulging of the diaphragm. Following perforation a triangular shadow with the base toward the liver and the apex extending toward the hilum can be visualized on the roentgenogram. This is true particularly in lateral roentgenograms although it is also seen in anteroposterior roentgenograms. In a series of 15 cases a shadow at the right base was found in 12; there was elevation of the diaphragm in 11; abscess of the lung in 3 and abscess with fistula in 2.

As in amebic hepatic abscess the diagnosis of amebic infections of the pleura and lung is not difficult if the condition is only considered by the clinician. Usually there is a history of involvement of the liver which is evidenced by pain and tenderness beneath the right costal margin. The presence of elevation and fixation of the diaphragm together with evidences of pulmonary manifestations particularly with the history of expectoration of chocolate sauce pus is sufficient to make a diagnosis until proved otherwise. A triangular shadow in the roentgenogram with its base toward the liver and its apex extending toward the hilum is of confirmatory evidence. The finding of amebas in the sputum together with relatively few micro-organisms is conclusive proof of the correct diagnosis. The demonstration of clear zones on the roentgenogram between the pulmonary shadow and the shadow produced by the liver is indicative of a hematogenous abscess. Amebic infections of the lung are likely to be confused with tuberculosis principally because of the chronicity of the condition and because of the profuse expectoration of bloody sputum. In tuberculosis however the greatest amount of involvement is usually at the apex whereas in amebiasis the lesion is generally at the base and associated with hepatic involvement. The absence of tubercle bacilli in the sputum on repeated examinations will exclude tuberculosis. Amebic infection is likely to be confused with pulmonary abscess from which it can be differentiated however by the absence of severe manifestations such as marked pyrexia and leucocytosis. The expectoration of relatively large quantities of

typical chocolate sauce pus is of diagnostic importance.

The prognosis in pleuropulmonary amebiasis depends upon a number of factors. The type of pleuropulmonary involvement is important as the prognosis is gravest in those cases in which a hepatic abscess ruptures into the pleural cavity and best in those cases in which there is direct communication between the hepatic abscess and a large bronchus with a minimum amount of pulmonary reaction. The prognosis is also dependent upon the type of therapy. In the collected cases in which the liver abscess was complicated by a hematogenous lung abscess the mortality rate was 81.2 per cent. In those cases in which the liver abscess was complicated by empyema the mortality rate was 77.7 per cent. In those cases in which the liver abscess was complicated by extension to the lung the mortality rate was 43.2 per cent whereas in those cases in which there was a bronchohepatic fistula the mortality rate was 10 per cent. In a recent analysis (60) of 21 cases admitted to the Charity Hospital and to the Touro Infirmary there was a mortality of 12.2 per cent in 9 cases in which rupture of a hepatic abscess occurred into the lung; in 7 cases in which the hepatic abscess ruptured into the pleura with the development of empyema the mortality rate was 57.1 per cent whereas in 5 cases in which the hepatic abscess ruptured into a bronchus and evacuated in this way there were no deaths. The importance of the type of therapy is illustrated by the results obtained with and without the use of emetine. In the collected series the incidence of recoveries without emetine was 43.9 per cent whereas with emetine it was 91.8 per cent. In our series these respective figures were 40 per cent and 100 per cent. In the cases treated by open drainage without amebicides the mortality rate was 48.2 per cent whereas in those cases treated by open drainage and emetine the mortality rate dropped to 16.6 per cent and only 5.4 per cent treated by emetine alone terminated fatally. The total mortality rate in the collected series was 41.1 per cent. In our recent analysis of 21 cases the mortality rate was 28.5 per cent.

The treatment of pleuropulmonary complications consists primarily of the systemic treatment of amebiasis. Emetine is the drug *par excellence* because the usually employed amebicides exert their action almost wholly if not entirely on the bowel. The value of emetine is illustrated by the recovery incidence of 40 per cent in the authors' cases treated without emetine and of 100 per cent in those receiving emetine. In the cases operated upon in the collected series the mortality rate



was 48.2 per cent without the use of emetine and only 16.6 per cent when emetine was administered. Emetine should be given in the same manner and in the same dosage for pleuropulmonary lesions as for hepatic lesions. Generally ultraconservatism is indicated in the treatment of pleuropulmonary complications, as illustrated by the results obtained in our cases in which there was a 33½ per cent recovery incidence after operation and a 100 per cent recovery incidence after conservative treatment with amebicides. In those cases in which there is an amebic hepatic abscess with pleural effusion, evacuation by aspiration is imperative. However in those cases in which evacuation of the abscess has been secured by a communication with the bronchus, usually anti amebic therapy is all that is necessary.

Amebic invasion of the cerebrum is a rare complication and according to Craig (14) has never been observed in patients who have not had previous dysenteric manifestations indicating that the original amebic infection is a severe one. The incidence of cerebral amebic abscess apparently is largely dependent on geographic location. Kartulis (40) in Egypt stated that brain abscess complicated 3 per cent of his cases of amebic dysentery. Of 56 cases collected by Izar (38), 29 occurred in Egyptians.

The *Entamoeba histolytica* gains entrance to the cerebrum through the blood stream. Runyan and Herrick (72) reported 2 cases of amebic cerebral abscess, one of which occurred shortly after drainage of a liver abscess and sponging of the cavity with gauze. It is possible that in this manner the organism gained entrance to the vessels as a result of trauma. Undoubtedly a relatively frequent antecedent lesion is a pleuropulmonary amebic involvement. The association of cerebral metastatic lesions with primary pulmonary affections is well known to thoracic surgeons and to pathologists. Suppurative and malignant processes in the lung frequently metastasize to the brain. Huard (37) collected 59 cases of amebic cerebral abscess, all of which terminated fatally. Only 4 were operated upon, in 6 there was rupture of the abscess into the ventricle, which resulted in rapid progression of the symptoms and death within a few hours. Cerebral amebiasis is usually rapidly progressive and, according to Craig (14) and Huard (37) the patients seldom live more than two weeks, death usually occurring in a week or ten days. The symptoms are similar to those produced by pyogenic cerebral abscess, differing only in severity and by marked progression of the amebic abscess. Because cerebral invasion represents an

overwhelming infection by *Entamoeba histolytica*, the prognosis is extremely grave and, as mentioned above, no patient having this complication has ever survived in spite of the various methods of therapy employed.

Relatively rarely the *Entamoeba histolytica* may invade the skin. In practically every instance this has resulted from drainage of an amebic process, either accidental or induced. Following an operation upon an amebic involved bowel, as in the appendiceal cecal region, amebic invasion of the wound may occur. Drainage of a liver abscess is less frequently complicated by cutaneous involvement. Occasionally cutaneous involvement results from perianal extension of an amebic infection in the distal portion of the rectum. Twenty-eight cases with amebic cutaneous involvement have been collected from the literature (4, 6, 7, 8, 9, 13, 20, 21, 24, 25, 26, 28, 33, 34, 35, 41, 46, 47, 49, 50, 51, 77, 79, 82), of which 11 presented perianal involvement (8, 20, 24, 41, 47, 51, 79, 82). Meleney and Meleney (49) emphasize that it is important to differentiate this progressive gangrene of the skin from postoperative synergistic gangrene which has been so admirably described by Meleney (48). Cutaneous involvement by amebiasis may occur, though rarely as a primary lesion as shown by the reports of Engman and Heithaus (25) and Hansen and Stark (33). In these cases there was apparently no evidence of internal amebiasis, but the *Entamoeba histolytica* was apparently introduced into the skin from without. Doria (24) describes a case of apparently primary subcutaneous amebic abscess.

The clinical manifestations of amebic cutaneous involvement consists of progressive extension around the site of drainage, which in a period of days or weeks becomes swollen. The edges of the skin become elevated and indurated. There is peripheral pigmentation. Necrosis of the skin with undermining is a prominent factor, and results in progressive cutaneous ulceration, the base of which is covered with adherent dirty grayish necrotic tissue. The discharge is frequently blood tinged and has a fetid odor. The treatment of cutaneous amebiasis consists of specific therapy in the form of emetine. In those cases in which the anti amebic therapy does not bring about a prompt subsidence of the symptoms radical excision of the ulcerating area by means of the high frequency knife is justified. The resulting defect following excision is covered with skin grafts.

Rarely splenic amebiasis may occur. The condition may be due to metastasis from the intestine or to the direct extension from an amebic hepatic

abscess involving the left lobe According to Huard (37) only 6 cases of metastatic splenic amebic abscess have been reported The lesion occurs so infrequently that it is of little clinical significance Its recognition is extremely difficult and the diagnosis is usually made after death

Extremely rarely amebic infection of the kidney can occur In most instances this is due as in the spleen to direct invasion from the amebic process in the liver In a few isolated instances apparently the lesion has been metastatic from the bowel and was unassociated with hepatic involvement Extension of an amebic process from the colon to the bladder with rupture of an abscess may result in the presence of entameba histolytica in the urine In 1911 Craig (19) reported a case in which the organism was found in the urine of a patient with a fecal fistula between the site of an amebic ulcer of the intestine and the bladder Similar cases have been reported by Baelz ( ) Fischer (27) and Walton (83) Primary amebiasis of the bladder probably never occurs the amebic infection is always the result of extension from the intestinal tract to this viscus Amebiasis may rarely involve the epididymis the testicle the fallopian tubes the prostate ovaries vagina cervix and penis Rarely the nasopharynx may be the site of amebiasis

#### SUMMARY

1 The ubiquitous occurrence of amebiasis necessitates serious consideration of this condition by surgeons in all parts of the world because it produces with sufficient frequency intestinal manifestations similar to those of other bowel lesions amenable to surgical therapy and extra intestinal lesions requiring surgical intervention

2 Amebic lesions of surgical significance may be classified as follows

##### a Intestinal lesions

- (1) Appendicitis
- (2) Perforation with resulting peritonitis
- (3) Massive hemorrhage
- (4) Ameboma (Amebic granuloma)
- (5) Cicatricial stenoses
- (6) Pseudopolyposis

##### b Extra intestinal lesions

- (1) Hepatic abscess
- (2) Pleuropulmonary affections
- (3) Cerebral abscess
- (4) Cutaneous ulceration and abscess
- (5) Splenic abscess
- (6) Genito urinary affections

3 Amebic appendicitis is one of the most frequent surgical complications of amebiasis and

may occur as an acute suppurative or chronic inflammatory process Approximately 10 per cent of patients with symptoms and signs of chronic appendicitis have amebic infection of the appendix which will subside following anti amebic therapy

4 Perforation with resulting peritonitis is one of the most serious complications of intestinal amebiasis which usually ends fatally unless localization occurs

5 Another grave but rare complication is massive intestinal hemorrhage The treatment which is conservative consists of the administration of amebicides and massive and repeated blood transfusion

6 Amebomas or amebic granuloma occasionally result from repeated amebic invasion of the bowel wall with consequent fibrous tissue reaction and tumefaction Occurring most frequently in the cecum and sigmoid they are of particular interest because they may so easily be confused with tuberculomas or actinomycotic and especially malignant lesions

7 Localized or diffuse cicatricial stenosis of the large bowel occasionally follows prolonged and recurrent infection and usually necessitates operative therapy

8 One of the most frequent surgical complications of amebiasis is amebic hepatic abscess the incidence of which is approximately 5 per cent of all cases of amebiasis Its pathogenesis clinical manifestations and diagnostic features are discussed in detail The treatment of amebic hepatic abscess consists of the administration of the amebicide *par excellence* emetine and aspiration of the abscess contents In 457 collected cases in which this form of therapy was used the mortality was 6.7 per cent as contrasted to a mortality of 44 per cent in 4760 collected cases in which open drainage was done In the authors series these respective figures were 3.6 per cent and 21.6 per cent

9 Pleuropulmonary amebiasis is usually a complication of amebic hepatic abscess and occurs in an incidence of approximately 16 per cent In the absence of secondary infection therapy is indicated

10 Less frequent extra intestinal surgical complications of amebiasis are cerebral abscess cutaneous ulceration and abscess splenic abscess, and genito-urinary affections

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## MISCELLANEOUS

### CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Lasher E P Jr and Glenn F Effects on the Kidney and the Blood Pressure of Artificial Communication between the Renal Artery and Vein *Arch Surg* 1939 38 886

The authors explain their technique for producing anastomosis between the renal artery and the renal vein and describe certain of the pathological and physiological effect of this procedure on the kidney. Dogs were used in their experiments.

The kidney distal to an arteriovenous fistula between its vessels rapidly undergoes a series of changes which culminate in entire replacement of the organ by dense fibrous tissue and calcium. A varying amount of parenchymal damage is evident but tubular changes are always seen. These changes usually consist in granular swelling of the epithelial cells of all part with desquamation of many of the cells of the descending limbs of Henle's loops and of the proximal convoluted tubules. As dissolution of the renal elements progresses the tissues become soft and small granules of gritty material can be felt in the outer cortex. The tubular changes proceed either to necrosis of the structures or to one of various stages of reconstruction and healing. Between the twentieth and thirtieth days the kidney undergoes anemic necrosis which usually involves the entire organ although a few renal elements about the pelvis and the arcuate vessels and just beneath the capsule may survive for a longer time. The organ becomes about half the normal size and is embedded in dense rather vascular fibrous tissue. Dilated collateral vessels which previously were present are no longer so greatly in evidence.

The authors did not observe any increase in the pulse rate after the formation of one fistula (or of bilateral fistulas) which could be attributed to another and more probable cause. Studies of the volume and cardiac output were not made. Definite evidence of cardiac hypertrophy was not found. The authors state that their failure to note any of the significant clinical or post mortem signs usually found in the presence of an arteriovenous fistula was due to the small caliber of the openings and the short periods of observation. In dogs between 30 and 45 lb in weight the formation of an arteriovenous fistula that is greater in length than 9 mm diverts a part of the renal blood supply sufficient eventually to inhibit completely the excretory utility of the kidney.

If bilateral fistulas of adequate size are established or if the normal kidney opposite to that in which a fistula is present is removed, the dog dies in uremia in from four to seven days. However small amounts of diluted urine may be excreted during the early postoperative period.

Since the construction of small bilateral fistulas does not result in fatal uremia the authors believe that the chief handicap to renal function in this condition is the lack of circulation of an adequate amount of blood through the organ.

SAMUEL H KLEIN M D

Hanes F M Hyperparathyroidism Due to Parathyroid Adenoma with Death from Parathormone Intoxication *Am J M Sc* 1939 197 83

Hanes reports a death from parathormone intoxication caused by a parathyroid adenoma.

The patient was a forty nine year-old woman who had been admitted to the hospital twice before with pyelitis and lime deposits in both kidneys. The roentgen rays showed already in 1932 a diffuse mottling of the kidneys which is regarded as a characteristic finding in parathyroidism at the present time. Recently the patient developed pain in her right chest and lost 30 lb.

Her temperature was 38.2 C. There was a 2 cm nodule at the left lower pole of the thyroid and an indefinite mass in the right hypochondrium. The roentgen rays showed the typical findings of hyperparathyroidism. The blood calcium was 20 mgm per cent phosphorus 4.7 mgm per cent. The patient usually cheerful became depressed and very weak. The calcium rose to 22 mgm per cent and the phosphorus to 4.8 mgm per cent the phosphatase showed 23 Bodansky units. The temperature rose to 38.5 C. The patient complained of generalized aching and she suddenly gasped for breath became cyanotic and expired.

The autopsy showed a cystic tumor of the left lower parathyroid gland. There were widespread injury necrosis and calcification of the connective tissue the basement membrane of the parenchymatous organs the arteries and the arterioles.

These autopsy findings parallel closely those of dogs killed with parathormone. The cause of death experimentally is circulatory failure this seemed to have occurred in the patient.

Fever seems to accompany parathyroid poisoning. In this instance it was taken as an evidence of a mild respiratory infection because of which the surgeon postponed the operation despite the rising calcium level. It is likely that frequent palpation of the tumor by numerous examiners resulted in expressing more and more parathormone into the circulation. The local necrosis of the tissues due to the hormone probably precedes the calcification. A 20 mgm per cent level of the blood calcium is very critical but recovery has been reported after a 23.6 mgm per cent level had been reached. The high phosphorus level as pointed out by Fuller Albright is an added danger signal. Albright advocates a low calcium diet in hyperparathyroidism. FRED S MODERN M D

Roovers, J J C P A. *Calcinosis Universalis Acta med Scand* 1939 100 57

The author discusses four groups of abnormal calcium deposits in the body

*Calcinosis circumscripta* In cases of calcinosis circumscripta there are present circumscribed not extensive calcium deposits in and under the skin. The condition attacks older people usually involves the arms and fingers and has a tendency toward localization. The general health is very little affected by these calcifications. The condition in this group of cases is still often being referred to by the name 'calcium gout' however as no metabolic disturbance which runs parallel with the metabolism of uric acid in cases of gout can be demonstrated it is better to use the descriptive nomenclature.

*Calcinosis universalis* Calcinosis universalis, affecting younger individuals, is characterized by extensive calcifications which may be found in various parts of the body. The calcium deposits are so generalized that the patients are often invalids. Muscular atrophy develops the general condition deteriorates and the weight diminishes to such a degree that cachexia is the result. Now and then acute exacerbations with new calcium deposits develop, combined with the formation of abscesses in and under the skin, and accompanied by fever. These abscesses may perforate and fistulas and ulcerations may develop. The prognosis is poor.

*Calcium metastases* Under the name "calcium metastases" Archow described calcifications in cases of decalcification of the bones (osteomyelitis, osteitis fibrosa generalisata, myelogenous leucemia) accompanied by nephritis. These calcium deposits are often explained by skeletal decalcifications as a result of which the blood is flooded with calcium, whereas the excretion of calcium in the urine is decreased. The calcium is precipitated especially in the tissues which excrete acid: the stomach, kidneys,



Fig. 2 After treatment

lungs, and the lung veins as here the blood contains little carbon dioxide.

*Dystrophic calcium deposits* This is the name applied to calcium precipitations which occur in various diseases, e.g., tuberculosis.

The formation of calcium in cases of calcinosis circumscripta and calcinosis universalis may be due to a primary affection. A support for this hypothesis is found in the fact that microscopically the affected tissues often show hyaline degeneration of the impaired tissue in the neighborhood of the calcium agglomerations.

Another hypothesis is a primary disturbance of the calcium metabolism. However the results of the examination of the blood and basal metabolism do not add support to this explanation.

Improvement of the condition has sometimes been described in the literature but complete recovery has never been obtained.

A case of calcinosis universalis is reported in which the patient, a five year old girl, was cured by the administration of sodium citrate by mouth and calcium Sandoz intravenously.

SAMUEL KAHN M.D.

Daland E M and Holmes J A. *Malignant Melanomas New England J Med* 1939 220 651

The authors' interest in malignant melanomas has been stimulated by the extreme pessimism expressed toward the disease by many members of the medical profession since malignant melanomas have been recognized as probably the most highly malignant of all tumors.

The authors have used the term 'malignant melanoma' to represent the tumors variously called melanotic sarcomas, melanosarcomas, or melano-



Fig. 1 Before treatment



Fig. 1. Malignant melanoma of the great toe

carcinomas. Masson has shown that these pigmented cells are ectodermal in origin and that they arise from cells of the neural crest. While the lesions are most frequently associated with the skin, they may arise in any part of the body. Cases of primary lesions in practically all structures have been reported.

Records totaling 174 have been reviewed. No marked difference was noted in sex incidence. There were 79 men and 95 women in the authors' series. In the cases of 25 patients, the primary focus was in the uveal tract of the eye. Frequent sites for this condition were the face, neck, and trunk. The incidence of malignant melanomas on the lower extremities is high, and these tumors represent more than half of the malignancies of the skin in this region.

Malignant melanomas arise in congenital pigmented nevi or as spontaneous primary growths. They rarely arise in pigmented hairy nevi. Trauma to a pre-existing lesion is probably a factor in stimulation of lawless growth. Cauterization or desiccation is dangerous. Metastases may occur through the skin lymphatics, the deep lymphatics, or via the blood stream. While the prognosis is particularly poor in patients with regional lymph node involvement, an occasional cure may be obtained. Patients should be given the benefit of adequate regional dissection.

The prognosis in malignant melanoma is very poor, however, a few patients can be cured by adequate surgery.

Adequate surgical treatment includes wide local removal and thorough dissection of the regional

nodes. The latter procedure, however, is not always feasible. In malignant melanomas of the eye, enucleation is adequate treatment. Roentgen therapy is extremely unsatisfactory, and only rarely is the patient benefited. It should be considered in inoperable cases. Spontaneous regression may occur in the metastases.

JOSEPH K. NARAT, M.D.

Poppe E. Carcinoma Cutis. *Am J Cancer* 1939; 36: 179.

The histological characteristics of the three types of skin carcinoma are briefly reviewed. One hundred and ninety-eight cases of cutaneous carcinoma (exclusive of carcinomas of the lip, anus, and vulva) were treated during the period from May 1932 to May 1935. In 172 instances the tumors were examined histologically.

Of 49 patients with squamous cell carcinoma, 21 were women whose average age was sixty-nine years and 28 were men whose average age was sixty-seven years. Twenty-seven of the 49 patients were free from recurrence for more than three years; 10 died from cancer of the skin, and 7 died from intercurrent disease within three years. Three who had shown improvement died from intercurrent disease, and 2 who had suffered a relapse after the first treatment became symptom free after further treatment.

Of 103 patients with basal-cell carcinoma, 50 were females whose average age was sixty-two and 53 were males whose average age was sixty-five. Seventy-nine of the group were free from recurrence for more than three years; 10 who were symptom free died from intercurrent disease within three years; 5 required further treatment. One patient lived with improvement of the cancerous condition; 3 who showed improvement but were not cured died from intercurrent disease, and 10 died of carcinoma of the skin.

Only 15 tumors of the intermediate type were encountered, and good results were obtained in this group. Thirteen patients were free from recurrence for more than three years; 2 died from intercurrent disease. One of the latter had been cured, and the other had shown improvement in the cancerous condition.

Of the total group of 198 patients, 10.2 per cent were free from recurrence for a period of more than three years, and 10.10 per cent of them died of carcinoma of the skin. The fatal cases are reviewed in detail.

In 45 cases the tumor was situated in the eyelid, or in the immediate vicinity of the eye. In 13 of the 45 cases permanent injuries followed in these the possible effect of irradiation could not be ruled out. Such changes resulted in only 1 case in which the implantation of radium needles was the only form of treatment employed. A radium mouldage was used alone in 16 patients; 3 of whom exhibited age injuries. Telerradium treatment alone or in conjunction with other methods was used in 14, and in 8 injuries to the eye occurred. One patient

was treated with roentgen therapy in combination with radium implantation. Two patients were treated by electrocoagulation.

The author concludes that irradiation particularly with radium probably produces better permanent results than surgical treatment, and the cosmetic result is as a rule more satisfactory.

HAROLD C. OCHSNER, M.D.

### DUCTLESS GLANDS

Aschheim S., Portes L. and Mayer M. *The Gonadotropic Hormones. A Critical Study with Regard to Their Role in the Physiology and Pathology of the Ovarian Functions* (Les hormones gonadotropes. Étude critique de quelques points relatifs à leur rôle dans la physiologie et la pathologie des fonctions de l'ovaire). *Ann. d'endocrinol.* 1939 1: 42.

Knowledge concerning the role of the anterior lobe of the hypophysis and its relations to the genital functions has been greatly extended by experimental studies during the past fifteen years. It was found that hypophysectomy caused arrest of the sexual development in young animals and marked regression of the ovaries in adult animals while injections of the extract from the anterior lobe stimulated the genital growth of the young organism and had a selective action on the suprarenal glands and especially on the ovaries. The ovaries underwent considerable hypertrophy with formation of numerous corpora lutea but without the production of premature artificial puberty. Later Zondek and Aschheim obtained all the characteristic aspects of maturity by the implantation of small pieces of the anterior lobe in immature animals; this experiment showing that the maturation of the ovaries depends on the action of a substance produced by the anterior lobe of the gonadotropic hormone. The changes caused by this hormone in the primary follicles are so clear cut and specific as to constitute a test of the presence and activity of the hormone and the different aspects of the ovarian effect are represented by Reaction I (the formation of enlarged follicles accompanied by luteinization of the cells of the vaginal mucosa), Reaction II (the formation of hemorrhagic follicles) and Reaction III (the formation of corpora lutea).

The experimental studies of Aschheim on pregnant women revealed the presence of gonadotropic substances similar to those of the hypophysis in the placenta, chorion, amniotic fluid, embryo, decidua, corpus luteum and its vicinity, blood, and urine. The hypothesis of hyperproduction of gonadotropic hormones by the hypophysis of pregnant women was consequently abandoned and the analogy of the effects obtained by the implantation of the anterior lobe and by the injection of placental extract led to the acceptance of the two substances as being biologically identical and to the designation of the gonadotropic substance which characterizes pregnancy as prolactin. Then arose the problem

whether the hypophyseal hormone and prolactin are one substance or two substances similar in their effects but of a different nature. A still more complex problem was the determination whether the different effects I and III are the result of a quantitative variation or of a diversity in the nature of several principles which respectively produce the increase which occurs in the volume of the follicles and their luteinization.

It was soon evident that complete identity did not exist between the hypophyseal gonadotropic hormones and prolactin; the effect of the former on the ovaries being much stronger than that of the latter. Prolactin has only luteinizing properties in hypophysectomized animals and, in order to explain its action on the follicles of immature animals, it was accepted that it exerts a direct effect on the hypophysis and through this intermediary stimulates the growth of the follicles. Other differences between the two substances are that prolactin causes the production of estrogenic hormone and that the hypophyseal gonadotropic hormone stimulates the testicles and ovaries of birds. The difference between the two hormones is also confirmed by the analysis of the biological reactions of pregnancy.

The studies of various authors have led to the conclusion that the hypophyseal gonadotropic hormones contain at least two factors. Factor A which causes enlargement of the follicles and subsequent estrus in immature animals, and Factor B which causes ovulation and luteinization of the follicles. Aschheim succeeded in producing a complete genital cycle in immature animals by the successive use of the urine of castrated women containing Factor A and of the hypophyseal extract containing Factor B. The results of his experiments were confirmed by various other authors. Undoubtedly the gonadotropic hormones are very complex substances which contain several principles or which may occur in several states that exercise similar or antagonistic actions.

The role of the gonadotropic hormones in the mechanism of the sexual functions may be conceived as follows:

1. Before puberty the anterior lobe of the hypophysis contains and secretes the hormone in small amounts but the receptor organs are apparently not affected by it.

2. During the sexual period the hypophysis secretes enough Factor A to cause complete ripening of the follicles and insure the production of estrogenic hormone. This causes estrus in the genital organs and acts on the hypophysis to inhibit the production of Factor A and stimulate that of Factor B. The luteinizing factor then acts on the ripened follicles to insure ovulation and luteinization and stimulates the production of progesterone. The menstrual flow decreases the amount of estrogenic hormone present in the blood; the inhibition of the hypophysis stops, and the secretion of Factor A recommences again starting the cycle.

RICHARD KEMEL, M.D.

Hamilton J B and Dorfman R I Influence of the Vehicle upon the Length and Strength of the Action of Male Hormone Substance Testosterone Propionate *Endocrinology* 1939 24 711

Comparison has been made of the action of testosterone propionate when injected in crystalline form and when dissolved in various solvents. This action was determined in terms of comb growth of day old chicks following a single injection of the androgen. The following conclusions were drawn:

Crystals gave the strongest and longest stimulation: a single injection of 20 mgm lasting for seventy-one days. Beef tallow was next best: a 20 mgm dose exerting an action like that of crystals for seventeen days and continuing to stimulate for twenty-even days. Palmitic acid was also a satisfactory vehicle. Peanut oil: an example of the oils which have been used routinely in clinical therapy, acted in a less pronounced manner over a total of seventeen days. Spermaceti wax and mineral oil gave less effects. Precipitation of the hormone from a solution injected intramuscularly resulted in less comb growth than that obtained when the hormone was dissolved in peanut oil. Twenty mgm of testosterone propionate produced a greater duration and maximum of comb growth than 10 mgm but the general response to different solvents was the same with both doses.

Pellets of crystalline hormone offer a means of administration which may be perhaps less expensive and more convenient and practicable clinically than the present intramuscular injection of oil solutions. With implantation methods the correct doses and the feasibility of the treatment in human beings have yet to be determined. There are definite dangers in

forms of administration that provide vigorous andogenic stimulation of long duration.

SAMUEL KAHN M.D.

Turner H H The Clinical Use of Synthetic Male Sex Hormone *Endocrinology* 1939 24 63

The author reports observations based on a group of 54 males ranging in age from seven to seventy-five years and showing various forms of genital hypoplasia and malfunctions of the sex organs. Pertinent data are presented concerning 15 selected cases typical of the group: 11 showed hypogonadism, 2 complained of impotency and symptoms of sexual decline, 1 had well developed symptoms of prostatic hypertrophy and 1 well advanced gynecomastia. All were treated with testosterone propionate, the synthetic male hormone.

In doses of from 10 to 75 mgm weekly it was found effective in all of the cases of hypogonadism as evidenced by the promotion of penile and hair growth, the production of erections and emissions, the development of the libido and potentia coeundi and by generalized changes in the secondary sex characteristics. Gynecomastia with normal secondary sex development was apparently not influenced by the hormone. Subjective symptoms of sexual diminution associated with senescence were considerably relieved as were the usual symptoms and signs of obstruction in cases of prostatic hypertrophy. While no undesirable effects were noted in any case it is advised that untoward effects be carefully sought for and beneficial action evaluated critically. Decision as to the continuance of treatment should be guided by the results.

WALTER H NADLER M.D.



# INTERNATIONAL ABSTRACT OF SURGERY

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## SURGERY AND THE BASIC SCIENCES

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### THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

A C IVY Ph D, M D and J S GRAY, Ph D, Chicago, Illinois

#### VITAMIN B<sub>2</sub> COMPLEX

EVER since Goldberger and his associates provided satisfactory evidence that pellagra is the result of a nutritional deficiency, a vast amount of experimentation has been undertaken with the purpose of producing in animals an analogous nutritional disorder, which could be employed for the isolation and identification of the responsible factor. By maintaining rats on a diet composed of foods commonly found in the diets of pellagrins, Goldberger and Lillie (1) produced a syndrome which they considered to be the counterpart of the human disease. By similar methods Goldberger and Wheeler (2) produced a nutritional disorder in dogs which not only resembled human pellagra in its symptomatology, but which was identical with a disease long known to veterinarians as blacktongue, a canine disease which occurs in areas where pellagra is prevalent. Subsequent investigation revealed that "rat pellagra" is not related to the human disease. It is now known that "rat pellagra" is the result of a deficiency of at least two dietary factors, which have been identified as riboflavin and Vitamin B<sub>6</sub>, a complex pyridine derivative. Since the rat apparently requires little of the true pellagra preventive factor, attempts were made to employ other animal species in the search for this factor. Norris and Ringrose (3) observed a pellagra like condition

in chicks which had been reared on an inadequate diet, but again subsequent investigation demonstrated that the deficient factor was not the pellagra preventive vitamin. Recent evidence indicates that "chick pellagra" is the result of a deficiency of pantothenic acid, previously known to be essential for the growth of yeast. When dogs, monkeys, or pigs are placed on a diet composed of foods commonly found in the diet of pellagrins, a nutritional deficiency develops, which resembles pellagra in man. In each of these animal species the administration of nicotinic acid has been shown to prevent or cure the disorder. As a result of these findings, nicotinic acid has been tested therapeutically in pellagra with striking success.

During the course of this quest in various species of animals for the pellagra preventive factor, four new vitamins have been discovered and isolated, and three of them have been chemically identified and synthesized. In addition several other factors have been disclosed which at present are under investigation. As these factors have been discovered interest has been directed toward the identification of the corresponding deficiency diseases in man. Recently considerable progress has been made along these lines.

With this summary as a background, the individual components of the B<sub>2</sub> complex will be considered in more detail.

*Nicotinic acid* The vitamin nature of nicotinic acid was discovered in 1937 by Elvehjem, Madden Strong, and Wooley (4) who found that this well known simple chemical compound effectively prevented or cured blacktongue in dogs. This discovery was quickly confirmed by Margolis, Margolis and Smith (5) and Sebrell, Onstott, Fraser, and Daft (6). A similar pellagra like condition had been produced in young pigs by Birch, Chick, and Martin (7). Following the discovery of the vitamin nature of nicotinic acid, Chick, Macrae, Martin, and Martin (8) reported that this disorder in pigs was corrected by nicotinic acid. This was followed by the announcement by Harris that the pellagra like syndrome which he had produced by dietary means in monkeys (9) could be controlled by nicotinic acid (10).

Although nicotinic acid produced striking improvement in dogs maintained on a blacktongue diet, evidence began to accumulate that such diets were lacking in more than one essential. Harvey, Smith, Persons, and Burns (11) as a result of their study of the effects of various liver fractions in the treatment of blacktongue concluded that more than nicotinic acid alone is required to correct completely the deficiencies of the blacktongue producing diet. Helmer and Fouts (12) showed that the usual diets are deficient in riboflavin as well as other factors. Failure of nicotinic acid or extracts containing this substance to cure completely and permanently all the symptoms exhibited by dogs maintained on these diets was observed by Margolis, Margolis and Smith (13), Nicolayson and Loland (14), and Sebrell, Onstott, and Hunt (15).

As a result of these findings it has been suggested that pellagra in man which results from the consumption of diets similar to those employed in the animal experiments is probably also a multiple deficiency disease. Adequate treatment must therefore include an improved diet and not merely supplements of nicotinic acid which are more economical for the patient than the improved diet. It has of course been suspected for years that the diet of pellagrins is deficient in more than one factor and recent experience with the disease amply justifies this belief.

Clinical trials of nicotinic acid in the treatment of pellagra were undertaken immediately following the announcement of its effectiveness in animal pellagra. Recently Spies, Bean, and Ashe (16) have published a review of their experience with nicotinic acid therapy. Their description of the effect of nicotinic acid follows:

The administration of adequate amounts of nicotinic acid or one of its compounds is followed

by the disappearance of many symptoms of the disease. Within 24 to 72 hours the fiery redness and swelling of the tongue, gums, mouth, throat, and vagina subside and the associated Vincent's infection disappears. Within 24 to 72 hours nausea and vomiting cease, increased salivation decreases and bowel movements become normal. Abdominal distention, pain and discomfort disappear and, in most cases, the desire for food returns. The acute fiery red erythematous dermal lesions in which the epithelium is intact, blanch within 48 hours after the administration of nicotinic acid, but where the continuity of the skin is broken and the lesions are moist, ulcerated, dry, or pigmented, there seems to be no specific benefit. Perhaps the most dramatic response of a pellagrins to nicotinic acid therapy is the disappearance of the acute mental symptoms. These symptoms, varying from slight confusion to delirium and mania, disappear rapidly, often over night. The maniacal patients become calm and the confused patients mentally clear. After therapy they become readjusted and often have excellent insight and memory of their actions, ideas, and surroundings during the psychotic period. Apathy and lassitude give way to interest.

Considerable interest has been evidenced in the response of the mental symptoms of pellagra to nicotinic acid. Spies, Aring, Gelperin, and Bean (17) have shown that both spontaneous and induced psychoses in pellagrins are corrected by nicotinic acid therapy. In a carefully controlled experiment they demonstrated that the prodromal neurotic symptoms of pellagra disappear under the influence of nicotinic acid. On the other hand, no beneficial effects were observed in a non-pellagrous group of psychotic patients. Evans (18) has described the case of a psychotic woman who on careful examination was found to have a mild stomatitis and glossitis but who would not have been suspected of having pellagra, had she not responded completely to treatment with nicotinic acid. Cleckly, Sydenstricker, and Geeshin (19) have reported excellent results with the vitamin in the therapy of various atypical psychoses. The one finding common to all the patients was stupor. Several had glossitis or vaginitis, but none had dermatitis or diarrhea. Most of the patients were elderly and their condition would ordinarily have been classified as arteriosclerotic encephalopathy. They conclude that hebetic grading into stupor may be the only sign of acute pellagra. Judging from these reports it would appear that an unknown but perhaps large number of psychoses are the result of an unsuspected and atypical nicotinic acid deficiency.

Atypical or monosymptomatic acute pellagra and early pellagra may be more common and more widely distributed than has heretofore been realized. Spies *et al* (16) have found subclinical pellagra to be common among the children of pellagrous families. It is detectable before it develops into frank pellagra only by a careful history and physical examination. This early stage of the disorder is characterized by a long prodromal period of ill health, marked by vague but persistent symptoms of loss of weight, strength, and appetite, also dyspepsia, irritability, inability to concentrate, and other similar symptoms which tempt the diagnosis of neurasthenia. These authors also point out that the requirements for nicotinic acid are increased by infection, physical exercise, and fever. Manson Bahr and Ransford (20) claim that in temperate climates like that of England, dermatitis is especially apt to be absent from the pellagra syndrome. France, Bates, Barker, and Mathews (21) relate the development of glossitis in 2 hospitalized patients who had received only intravenous nourishment for several weeks because of persistent nausea. Under the influence of nicotinic acid the glossitis promptly cleared up, appetite was restored, and the general condition of the patients was greatly improved. In "Conferences on Therapy" of the American Medical Association (22), Rhodes has described the occurrence of a typical pellagrous glossitis in convalescent pneumonia patients. This disappeared after the administration of yeast or liver extract. Comment is also made upon the fact that some years ago when the diet of the typhoid patient was changed from a starvation to a highly nutritious diet, marked improvement resulted not only in the general condition of the patient, but also in the appearance of the tongue. According to Crandall, Chesley, Hansen, and Dunbar (23) nicotinic acid therapy alleviates certain types of functional disorders of the gastro-intestinal tract. In parallel studies on dogs they have found that disturbances of gastro-intestinal motility appear before other accepted signs of nicotinic acid deficiency.

Occasionally patients with pellagra exhibit a peripheral neuritis, which is not improved by nicotinic acid therapy, but which responds to Vitamin B<sub>1</sub> or thiamin (16). Recently Lewy, Himwich, Frostig, and Spies (24) have studied in detail the condition of beri beri which occurred in 8 pellagrins who were maintained on their original inadequate diet but were given supplements of nicotinic acid and riboflavin. These patients developed a psychoneurotic syndrome and symptoms and signs of peripheral neuritis. The intra

venous injection of cocarboxylase produced marked improvement within from two to four hours. Cocarboxylase, the pyrophosphate of thiamin, is a co-enzyme which is involved in the carbohydrate metabolism of animal tissues. By injecting thiamin in the form in which it acts in the tissues, beneficial results were obtained almost immediately. These effects consisted of an improvement of the psychoneurosis and a diminution of the peripheral neuritis, as revealed by a restoration of neuromuscular irritability (chronaxy), the disappearance of hypo-esthetic areas of the skin, and the return of normal pupillary and corneal reflexes.

In addition to nicotinic acid and thiamin, the diet of the pellagrins is usually deficient in riboflavin and Vitamin B<sub>6</sub>. The symptoms associated with deficiencies of these factors will be discussed later with the vitamins concerned.

The action of nicotinic acid in the tissues is known to some extent as the result of investigations in an entirely different field. The process of sugar fermentation by yeast has been the subject of investigation since the time of Pasteur. Although an enzyme called zymase was known to be involved in yeast fermentation, it was not until 1904 that Harden and Young (25) discovered that a heat stable substance must be present to assist the enzyme. This substance was called cozymase. In 1936 Warburg and Christian (26) succeeded in isolating cozymase and they identified it as diphosphopyridine nucleotide. Another enzyme system which is involved in carbohydrate oxidation in animal tissues was found to require a co-enzyme, which Warburg, Christian, and Griese (27) identified as triphosphopyridine nucleotide. Both of these co-enzymes contain nicotinic acid as their active nucleus. Accordingly, nicotinic acid is now known to function as a co-enzyme in carbohydrate oxidations.

That nicotinic acid in the blood and urine of normal subjects exists in the form of these co-enzymes has been shown by Vilter, Vilter, and Spies (28), and Kohn (29). These investigators have also observed a diminished quantity of these nicotinic acid compounds in the body fluids of pellagrins. Some progress has been made in the development of chemical methods for the determination of nicotinic acid in the blood and urine (see Vilter, Spies, and Mathews, 30, and Pearson, 31).

**Riboflavin.** Goldberger and Lillie (1) found that rats maintained on a pellagra producing diet developed a severe dermatitis, which was believed to represent the equivalent of human pellagra. Subsequent workers, however, encountered diffi-

culty in confirming these results. Failure of growth was commonly observed but the dermatitis was disappointingly variable in type and in incidence. For a period of years confusion reigned because different workers used different diets and different supplements without knowledge of their content of a number of dietary essentials. The first decisive advance came when Kuhn, Gyorgy, and Wagner Jauregg (32) isolated a flavin compound from eggs and found that it promoted growth when fed to rats on a pellagra type of diet. Shortly after this Kuhn, Reinemund, Weyand, and Strobele (33) and Karrer, Schöpf, and Benz (34) synthesized this yellow pigment now called riboflavin which Gyorgy (35) demonstrated to be biologically active. At about this same period pure thiamin became available for experimental purposes and as a result rapid advances were made possible. Gyorgy (36) found that rats maintained on a pellagra producing diet supplemented with pure thiamin instead of impure extracts of unknown composition failed to grow and developed a severe dermatitis of the extremities and the face. The addition of pure riboflavin to the diet resulted in a resumption of growth but the dermatitis persisted. An extract of yeast which had been freed of riboflavin was found to cure the flord dermatitis but growth remained subnormal and a mild dermatitis limited to the body of the animals and consisting essentially of loss of hair or denudation appeared. This was a conclusive demonstration that the rat required two components of the B<sub>2</sub> complex: riboflavin and a supplementary anti dermatitis factor which he named Vitamin B<sub>6</sub>.

In addition to cessation of growth and the appearance of denudation, riboflavin deficiency in the rat is accompanied by other symptoms. According to Day and Langston (37) if proper precautions are taken to insure a very low riboflavin intake, rats develop conjunctivitis and keratitis followed by the appearance of cataract. Day, Darby, and Langston (38) have shown that riboflavin prevents the occurrence of this type of cataract. However, Mitchell and Cook (39) were unsuccessful in preventing the type of cataract which appears in rats when fed a high galactose diet by the administration of riboflavin. Smith (40) has reported that thinning of the epithelium and atrophy of the sebaceous glands of the tail occur in rats maintained on a diet deficient in riboflavin. The suggestion is made that these changes may be analogous to similar changes in the skin observed in pellagra in man.

Riboflavin has also been shown to be essential for the dog. Sebrell, Onstott, and Hunt (41)

noted that dogs maintained on a blacktongue diet, but relieved of their main symptoms by treatment with an extract containing nicotinic acid, became suddenly ill, collapsed and died. At autopsy, yellow or fatty livers were found. One dog at the first sign of collapse was given an injection of riboflavin and promptly recovered. Further study of this syndrome (42) revealed it to be accompanied by bradycardia, sinus arrhythmia, a variable dermatitis, and anemia. Autopsy revealed degenerative changes in the brain and spinal cord as well as in the liver. Street and Cowgill (43) have also reported that dogs on a diet deficient in riboflavin collapse suddenly in a characteristic manner. The collapse is accompanied by a fall in body temperature and respiratory rate and by cardiac arrhythmias. Recovery followed the injection of pure riboflavin.

Since riboflavin has been shown to be necessary for the rat, dog, and probably also for pigs, chicks, and turkeys, it might be expected to be necessary also for man. Sebrell and Butler (44) have noted the characteristic symptoms which developed in 18 women who were placed on a diet deficient in riboflavin. Cheilosis, perleche, and a seborrheic dermatitis were the outstanding findings. The lips became reddened as a result of thinning of the epithelium. At the angles of the mouth pallor appeared followed by maceration and the development of transverse fissures which extended into the skin of the face. A fine scaly, slightly greasy desquamation on a mildly erythematous base appeared in the nasolabial folds on the alae nasi and in the vestibule of the nose and of the ears. These symptoms disappeared under the influence of riboflavin. Oden, Oden, and Sebrell (45) claim that these symptoms of riboflavinosis are not uncommon in the South and present 3 cases that responded to riboflavin therapy. Vilter, Vilter, and Spies (28) noted that certain pellagrins allowed to remain on an inadequate diet but treated with nicotinic acid and thiamin retained a residue of symptoms consisting of mild dermatitis and loss of appetite and weight. The administration of riboflavin brought a prompt response in these patients. These symptoms of cheilosis, angular stomatitis, and dermatitis resemble certain syndromes which have repeatedly been reported from tropical countries and which have responded to the administration of liver or yeast (see Sebrell, 46).

Riboflavin like nicotinic acid and thiamin, operates in animal tissues in oxidative enzyme systems. It is a component of Warburg's yellow enzyme which is almost universally distributed and is involved in many oxidative processes.

Riboflavin is relatively non toxic, for Kuhn (99) has shown that a dose 1,000 times the therapeutic dose and Demole (100) has shown that one 5,000 times the therapeutic dose exhibit no toxic manifestations

**Vitamin B<sub>6</sub>** As previously mentioned the availability of pure thiamin and riboflavin made it possible for Gyorgy (36) to demonstrate that rats receiving only these two components of the B complex develop a florid dermatitis of the extremities and of the face. This dermatitis, which was named acrodynia because of its resemblance to infant acrodynia, could be cured by the administration of an extract of yeast. The active component of such extracts was named Vitamin B<sub>6</sub>. As a result of intensive work on this vitamin, its isolation in crystalline form was announced in 1938 from five different laboratories. According to Stiller, Keresztesy, and Stevens (47), and Kuhn, Wendt, and Westphal (48) Vitamin B<sub>6</sub> is a pyridine derivative, 2 methyl, 3 hydroxy, 4, 5 di (hydroxymethyl) pyridine. The compound has been synthesized by Harris, Stiller, and Folkers (49) and the synthetic preparation has been shown to be biologically active by Harris and Folkers (50).

Recent investigations have shown that Vitamin B<sub>6</sub> is concerned with fat metabolism. Halliday (51) has found that in the absence of this vitamin, rats develop enlarged and fatty livers and that this condition is only partially corrected by the administration of choline. Salmon (52), Birch (53), and Quackenbush, Platz, and Steenbock (54) have demonstrated that the essential unsaturated fatty acids, once known as Vitamin F, and Vitamin B<sub>6</sub> are both essential for the prevention of acrodynia in rats. In the earlier work the partial deficiency of essential fatty acids made it appear that only Vitamin B<sub>6</sub> was concerned. However, in the presence of only small amounts of the vitamin the presence or absence of adequate amounts of the essential fatty acids will determine the occurrence of the disorder. It has been suggested, therefore, that the dermatitis of the extremities noted some years ago by Burr and Burr (55), when rats were maintained on a fat free diet, was true acrodynia. It is possible that Vitamin B<sub>6</sub> is essential for the proper metabolism of the essential fatty acids.

Vitamin B<sub>6</sub> has been shown to be a dietary essential for a number of animal species. This has been shown for the pig by Chick, Macrae, Martin, and Martin (56). According to Fouts, Helmer, Lepkovsky, and Jukes (57) dogs develop a severe microcytic, hypochromic anemia when rendered deficient in Vitamin B<sub>6</sub>. This anemia

has been shown to respond to the administration of crystalline Vitamin B<sub>6</sub>, by Fouts, Helmer, and Lepkovsky (58).

There is some evidence to suggest that Vitamin B<sub>6</sub> is an essential factor in the human dietary. Gyorgy (36) commented on the resemblance between rat acrodynia and human acrodynia. The latter disorder has been suspected of being a nutritional disease, and Wylie and Stern (59) have recommended liver, and McClendon (60) has recommended Vitamin B complex in the form of yeast in the therapy of acrodynia. Tisdall, Drake, and Brown (61) have found that nicotinic acid has no therapeutic value in the treatment of this condition. The possibility remains that Vitamin B<sub>6</sub> and the essential unsaturated fatty acids may prove to be effective. Spies, Bean, and Ashe (62) have recently reported that certain pellagrins, subsisting on their usual inadequate diet but receiving supplements of nicotinic acid, riboflavin, and thiamin, retain a residue of symptoms consisting of extreme nervousness, insomnia, irritability, abdominal pain, weakness, and difficulty in walking. The similarity between these symptoms and the general symptoms of infant acrodynia may be significant. Four pellagrins exhibiting the above symptoms were treated with synthetic Vitamin B<sub>6</sub>. Within four hours they obtained dramatic relief.

**Pantothenic acid** Norris and Ringrose (3) observed a severe dermatitis in chicks which had received an inadequate diet. Subsequently, Kline, Keenan, Elvehjem, and Hart (63) produced a similar disorder, which they believed to be analogous to pellagra in man. In chicks the lesions occurred around the eyes and mouth and on the extremities. They could be cured by the administration of autoclaved yeast. In succession it was shown that a cure could not be effected by riboflavin (Elvehjem and Koehn, 64) by nicotinic acid (Mickelsen, Waisman, and Elvehjem, 65), or by Vitamin B<sub>6</sub> (Lepkovsky, Jukes, and Krause, 66). Recently Jukes (67) has reported that a preparation of pantothenic acid, supplied to him by Williams, was effective in curing chick dermatitis. Both the chemical and biological evidence indicated that the chick anti dermatitis factor and pantothenic acid are identical. Wooley, Waisman, and Elvehjem (68) discovered that the chick anti dermatitis factor is composed of  $\beta$  alanine joined to a hydroxy acid, and that the chemical evidence indicated its identity with pantothenic acid.

Pantothenic acid was the name given by Williams *et al* (69) to an unidentified factor which they had found essential for the growth of

yeasts They considered the name appropriate because of the almost universal distribution of the factor Williams *et al* (70) have prepared highly purified but not crystalline extracts from liver Its empirical formula has been closely approximated (71) and it has been shown to be composed of  $\beta$  alanine conjugated with a hydroxy acid (72) Pratt and Williams (73) have provided evidence to indicate that pantothenic acid is involved in oxidative processes As yet no symptoms of pantothenic acid deficiency have been identified in man

*Other factors* In an attempt to produce cataract in monkeys Day Langston and Shukers (74) placed these animals on a riboflavin deficient diet Instead of cataract the monkeys developed a nutritional disease characterized by leucopenia anemia diarrhea and gingival ulcers Langston Darby and Shukers (75) have found that this

condition cannot be cured by the administration of thiamin riboflavin, or nicotinic acid although either yeast or liver proved to be effective supplements

Several additional factors have been described as necessary for the rat A factor necessary for the prevention of graying of the hair has been described by Morgan, Cook, and Davison (76) Lunde and Kringstad (77) and Morgan and Simms (78) Factor W is the name given by Frost and Elvehjem (79) to a factor which they claim is necessary for growth in the rat Oleson, Bird Elvehjem and Hart (80) consider a 'spectacled eye' condition in rats to be the result of a nutritional deficiency For the chick Stokstad and Manning (81) have claimed a new growth factor It is still too early to say whether these proposed new factors are indeed new nutritional requirements

## REACTIONS TO INTRAVENOUS THERAPY

Considerable attention and effort has been devoted to the problem of eliminating thermal reactions to intravenous therapy Rather elaborate rituals have been routinely observed but have not always proved to be as successful as they have been elaborate It was shown many years ago that thermal reactions to intravenous infusions are due in the great majority of instances to bacterial contamination of the distilled water Since this fact has not been generally appreciated it may be of some advantage to review the subject here

In 1911 Wechsellaum (82) observed that thermal reactions to the intravenous injection of salvarsan could be materially reduced by the use of only freshly distilled water to dissolve the drug He considered the possibility that bacterial contamination might be responsible for the undesirable reactions In response to this suggestion Muller (83) made bacterial counts on a large number of samples of distilled water and found them to be heavily contaminated Also in 1911 Hort and Penfold (84) demonstrated that distilled water injected intravenously immediately after distillation produced no fever If the water was allowed to stand for several days organisms developed in large numbers and fever followed its injection The fever however could not be attributed to the bacterial bodies themselves because reactions were obtained after centrifuging and after filtration through a Berkefeld filter

These findings were completely neglected for the following twelve years In 1923 Seibert (85) conducted an extensive and carefully controlled

investigation of this problem by using rabbits for the measurement of the intensity of the fever reaction She was able to demonstrate that the fever which follows the intravenous injection of certain distilled waters is not due to (a) the rate of injection (b) hypersensitivity in the injected animal (c) to pH of the water (d) erythrocyte hemolysis or (e) the presence of impurities such as inorganic salts dissolved glass dissolved gases from the air or constituents derived from cork stoppers Reactions could be avoided entirely by the use of freshly distilled water from a still equipped with a spray trap to prevent mechanical carrying over of undistilled water If such non reactive water was allowed to stand for several days it became reactive This did not occur however if the freshly distilled water was sterilized and kept sealed The pyrogenic substance could not be removed by filtration through a Berkefeld filter nor could it be destroyed except by drastic heating Waters which were capable of producing fever always contained organisms and filtrates prepared from pure cultures of such organisms were also capable of producing fever Although organisms could occasionally be isolated from non reactive waters culture filtrates of such organisms failed to produce fever The fever producing substance which was named pyrogen was considered to be a product elaborated by certain types of bacteria capable of growing in distilled water Seibert (86) later studied in more detail some of the properties of pyrogen and Bourn and Seibert (87) investigated the bacteriological characteristics of the pyrogenic organisms

The results obtained by Seibert have been completely confirmed by all who have subsequently studied the question. Among these might be mentioned Rademaker (88), Thompson (89), Banks (90), Bleyer and Rhode (91), and very recently Nelson (92). All these investigators emphasize the necessity of obtaining distilled water from a still equipped with a spray trap in order to prevent contamination of the distillate with undistilled water. When this precaution is taken, pyrogen free water is obtained and, if sterilized immediately and kept sealed, the water will remain pyrogen free. *Sterilization will not destroy pyrogen after it is formed.* If solutions made up from pyrogen free water are to enter the patient's system still free of pyrogen, precautions must be taken to prevent contamination of the venoclysis set up. Co Tui and his associates (93) have shown that pyrogen may be removed from solution by filtration through a membrane of the proper porosity or by filtration through a Seitz bacterial filter which adsorbs the pyrogen.

This long neglected work has important bearings on fields other than the preparation of non reactive fluids for venoclysis. It has for many years been assumed that the fever which follows the injection of vaccines, milk, or other foreign protein is due to a special property of proteins or their split products. However, Seibert and Mendel (94) demonstrated that freshly collected and sterile milk did not produce fever, neither did egg white obtained fresh from a sterile egg. Both of these materials on standing or manipulation became pyrogenic, however. Occasional attempts to prepare purified proteins free of pyrogen were successful. It was suggested, therefore, that the production of fever is not a property of proteins or their split products, but is probably the result of contamination with organisms capable of producing pyrogen. Barkan and Nelson (95) reported that they had encountered difficulty in producing reactions in patients when milk was used for non specific protein therapy. Further investigation revealed that this was caused by the use of high grade milk containing few organisms. They found a relationship to exist between the number of organisms in the milk and its potency in producing fever. Filtrates prepared from the contaminating organisms were also found to produce fever.

Typhoid vaccine has been widely used to produce fever. Co Tui, Benaglia, Ruggiero, and Yates (96) have shown that removal of the bacterial bodies by Berkefeld filtration does not reduce the effectiveness of the vaccine for the production of fever. The pyrogenic material

could be removed from the vaccine by adsorption on a Seitz adsorption filter, just as it can be removed from reactive distilled water. This does not mean that the typhoid cultures were necessarily contaminated with other organisms, it is very possible that the typhoid bacillus should be included among the organisms capable of producing a pyrogen. In fact the pyrogenic organisms isolated by Seibert from distilled water closely resemble the enteric group of bacteria.

Dangerously severe reactions are not uncommonly encountered in non specific protein therapy. They result frequently from overdosage, but overdosage of a preparation of unknown potency is not always easy to avoid. Probably untoward reactions could be materially reduced if these preparations were biologically standardized according to their pyrogenic potency.

When the inulin clearance test was first introduced as a method of measuring kidney function, occasional batches of inulin produced severe thermal reactions. Co Tui, Schrift, McCloskey, and Yates (97) showed that these reactions were probably due to pyrogen, which they were able to remove by adsorption filtration. Similarly, reactions following the injection of certain gum-acacia solutions were found to be due to pyrogen by Co Tui, Schrift, and Ruggiero (98).

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# OSTEOMYELITIS OF THE SKULL

## Collective Review

HARRIS P MOSHER, M D, F A C S, Boston Massachusetts

**O**STEOMYELITIS of the skull is one of the most dreaded diseases which the surgeon is called upon to treat. In the frontal bone it occurs most frequently as a complication of acute infection of the frontal sinus. Swimming is the cause of many of the fulminating cases. Trauma also can be followed by osteomyelitis. The process after trauma is less virulent and tends more to localize and to form sequestra.

**Organisms** The organism is usually the staphylococcus aureus. Rare cases have been attributed to the colon bacillus and to the streptococcus. A recent observer believes that anaerobic bacteria may be the responsible organisms in some cases.

The great questions in osteomyelitis of the skull are when to operate, and how radical the removal of bone should be. Tunneling a trough through both layers of the skull supposedly well ahead of the infection has not proved successful. The operator must decide whether he is dealing with a fulminating case or one of less virulence in which localization and sequestration may be expected, for on the correctness of his judgment depends the life of the patient.

Sulfanilamide does not seem to be indicated, however, if a case does not respond to surgery, the author would surely try it. Its success in gas bacillus infection has just been reported.

The seriousness of osteomyelitis of the skull comes from the fact that it may spread until it involves the whole calvarium, and in fully half of the cases it is complicated by an extradural or subdural abscess. Brain abscess also is a frequent complication. Meningitis is the usual termination when operation has not been successful. At operation any or all of these complications may be present, and the surgeon has to be constantly on his guard to detect them and deal with them.

**Types** In the last few years, many surgeons have tried to classify osteomyelitis of the frontal bone by dividing it into various types. So far this is chiefly of academic interest. For practical purposes there are but two types, the fulminating, spreading type, and the type in which the infection tends to halt and localize with the formation of a sequestrum.

In 1933, the author published an article giving the results of his observations on 7 cases of osteomyelitis of the frontal bone. Since then he has written two more articles. He considers the conclusions which he gave in the first paper valid today. The cases treated on the basis of these conclusions at the Massachusetts Eye and Ear Infirmary for the past five years have been increasingly successful.

**Signs** The signs of osteomyelitis of the frontal bone are a pitting edema of the skin of the brow (Pott's puffy tumor) along with edema over the anterior surface of the frontal sinus. The edema extends a variable distance up the forehead, often reaching the hairline, and is tender on pressure.

**Symptoms** The symptoms are those of a sick, and obviously septic patient.

**Diploic veins** In 200 head films, diploic veins were absent in only 3 per cent, that is, they are practically always present. In one third of the 200 films central veins were present alone, in one third lateral veins alone, and in one third central and lateral veins were present together.

The frontal diploic veins connect with the superior longitudinal sinus, the anterior temporal diploic veins connect with the deep temporal veins, and the posterior temporal vein drains into the lateral sinus. The occipital diploic vein drains into the torcula. Each diploic vein has not only the deep connections just given, but connects superficially with the veins of the scalp.

The size of the diploic veins is often startling (Fig 1). For instance, it is not uncommon for a vein to be one half the width of the frontal bone. To make a scale model to illustrate and visualize this, one might take a piece of 2 by 4 joist and bore a tunnel 1 in. in diameter through it longitudinally. This would give a graphic idea of the size of the principal diploic veins. It is therefore easy to see how veins of such size can carry a large amount of infected blood and carry it long distances.

The lambdoidal suture is often seen to be projected forward into the frontal region, and when the suture is not complete, parts of it might easily be mistaken for diploic veins.

**The pathways of infection** The chief pathway of infection is by way of the diploic veins, and

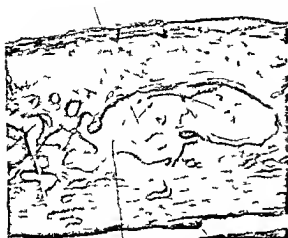


Fig. 1 Osteomyelitis of the frontal bone—frontal sinus. The illustration is from a section of the frontal bone. Two infected coalescing veins are present. The two veins taken together measure nearly the width of the frontal bone. The veins therefore are much larger than we realize and offer a wide channel through which infection can be carried.

the spread of the infection is due to the number and size of the veins. The infection may come to the surface of the bone and run along under the periosteum. It always is sufficiently close to the surface to produce the pitting edema of the periosteum and skin. It may turn inward and extend between the dura and the skull. Infected blood clots are often found in this region. Finally the infection may localize temporarily or permanently and destroy the bone through and through. Over this area there may be a subperiosteal abscess or below it an extradural abscess. The spot of localization and necrosis may be far away from the original source of infection, even at the vertex of the skull.

The author has studied the extent of the infection of the bone marrow in serial sections of one piece bone specimens which took in the whole brow that is from the hairline down through the front and posterior walls of the frontal sinuses and laterally to the external angular process of the frontal bone in other words to the outer angle of each orbit.

In the study of the progress of the infection in the bone specimens it was striking to see how soon fibrous tissue was found in the marrow spaces in fact they were often found to be obliterated by it. An infected marrow space may border a normal space on one side while on the other the space will be filled with fibrous tissue. One gets the impression that this rapid and early formation of fibrous tissue may be nature's attempt to wall

off and localize the infection. In the presence of the free connections between the veins of the mucous membrane of the frontal sinus and the diploic veins of the frontal bone it would seem that osteomyelitis of the frontal bone would be more frequent after infection of the frontal sinus were it not for some such factor as this. Next to the virulence of the causative organism of the infection this early fibrosis of the marrow spaces may be the determining factor.

In a recent case of fulminating infection of the frontal sinus with osteomyelitis of the frontal bone the bone specimen removed included both the front and the posterior walls of the frontal sinus. The lumen of the sinus was practically obliterated by the swollen and infected mucous membrane. It was studded with large veins much larger than the writer ever imagined they could be. They were continuous with the veins of the frontal bone and one could readily see how the infection from the sinus reached the frontal bone.

In osteomyelitis of the bones of the leg the pus first accumulates under the periosteum and courses along beneath it. A similar action takes place in severe infections of the sinus mucous membrane for example in the case just mentioned there was marked subperiosteal hemorrhage and infection.

In 1 patient at the Infirmary a boy of twelve the pus accumulated under the periosteum in the left temporal fossa and gradually made its way to the posterior occipital protuberance. After repeated operations the osteomyelitis stopped and the outer table of the skull, which was the part chiefly involved regenerated. The boy finally died of a brain abscess. An abscess had been suspected but exploration for it had been unsuccessful.

One usually thinks of osteomyelitis as advancing upward on the front face of the frontal bone instead of extending to the outer angle and progressing from there. In the case just mentioned however the greatest swelling and tenderness were in the left temporal fossa and a large piece of infected bone was removed from this locality. The author has learned to be suspicious of the outer angle of the frontal sinus and of the external angle of the frontal bone. In what he likens to the complete operation the bone flap should extend laterally far enough to reach the outer limit of the frontal sinus and at least encroach on the anterior limit of the temporal fossa. In 2 cases in which this was not done a second operation was necessary on account of infection at one of these two points which had been missed at the first operation.

**X ray and laboratory findings** The x rays will show the number and size of the diploic veins, and their location. In a late case, often one vein is seen to enlarge progressively and appear to worm its way slowly upward and backward. Presumably it is this vein which is the chief pathway of the infection. The x rays will not show bone necrosis for from seven to ten days after the edema of the forehead appears. For this reason the edema is more important for the diagnosis than the x ray film. Waiting for bone necrosis to appear is not defensible in the light of our present knowledge because the infection of the medulla of the bone reaches as far and sometimes farther than the pitting edema. Thus the author has often proved by the examination of many large bone specimens. Cases with bone necrosis often appear at the hospital. Here again the laboratory has given helpful information, it has shown that the infection of the medulla of the bone extends from 1 to  $1\frac{1}{2}$  in beyond the area of necrosis.

**Histological examination of two bone specimens** The following description is given in order to illustrate and summarize the bone changes in osteomyelitis of the frontal bone.

In the first specimen to be described the bone was taken adjacent to the original source of infection, namely the frontal sinus and its vertical diameter extended about 2 in. from the upper rim of the sinus. The second specimen was taken at a distance from the original source of infection, that is, at the top of the forehead, and consisted of a bone flap measuring  $2\frac{1}{2}$  by 3 in. It was perforated in the center by a necrotic area, which connected superficially with a subperiosteal abscess and internally with an extradural abscess.

In the first specimen, taken from what might be called the more acute case, the marrow spaces were crowded to overflowing with large and small lymphocytes. The majority of the marrow spaces were markedly infected and many of them contained true abscesses. There was some fibrous tissue, but it did not predominate. Infected vessels were found to be making their way to the surface of the bone, both externally and internally. The infection broke through the inner table more often than through the outer. The extension of the infection seemed to be more inward than outward. There was new bone on the surface of this specimen next to the dura. The inner surface of the new bone was covered with a layer of infected blood clot and in places with infected granulation tissue.

The impression which the bone gave was that the majority of the marrow spaces were acutely infected, as shown by the great increase of the

cellular elements, especially the small and large lymphocytes, and the large numbers of polymorphonuclear leucocytes. In this case the osteomyelitis was circumvented and cured by operation.

In the second specimen the bone flap was removed at a distance from the original source of infection after two other bone flaps had been removed and the condition had been of much longer duration than in the first case. In this specimen there was true abscess formation in the marrow spaces near the necrotic area in the center of the bone flap. There were a few scattered abscesses in other parts of the bone, but the predominant picture was that of fibrosis of the marrow spaces.

On the inner surface of the bone flap there was a longer and larger layer of new bone than in the first specimen. Through this, many infected vessels ran to the dural surface. There was an infected blood clot between the dura and the bone, and the vessels in the fibrous tissue that connected the dura and the under surface of the skull were often infected. Again the impression was that the greater extension of the infection was inward. The extensive fibrosis of the marrow spaces suggested that the infection for the greater part had been conquered and walled off except along the track of the infected vein which led to the necrotic perforation in the center of the bone flap. Infection was found to extend to the edge of the bone in all directions.

The first specimen, therefore, showed the acute fulminating type of infection, and the second showed bone in which the infection had cleared up for the most part and the marrow spaces had been obliterated by fibrous tissue.

**The incision** Four types of incision have been used to expose the frontal bone: a U shaped incision with the base up, a U shaped incision with the base down, a median incision from the hairline to the root of the nose joined by a horizontal incision paralleling each eyebrow, and the incision advocated by von Eicken, a right angular incision with the point of the angle at the external angular process of the frontal bone (Fig. 2). The author prefers a central incision meeting a horizontal incision above each eyebrow. The main point is to get a thorough exposure of the whole front surface of the frontal bone. Timid incisions breed timid surgery.

The U shaped flap which turns down does not give full vision of the wound postoperatively or full drainage. The U shaped flap which turns up should give better cosmetic results. However, it does not cover the edges of the bone defect well.

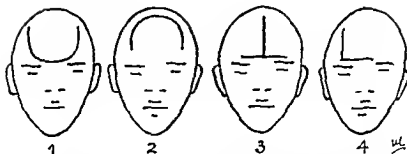


Fig. 2 Various types of flap The author prefers the third

and is harder to bring down into place in the plastic repair

The right angular flap of von Eicken does not appeal to the author because it limits the exposure of the frontal bone especially at the opposite external angular process of the frontal bone. One of the things he has learned about these cases of osteomyelitis is to watch the external angular process of the frontal bone on both sides.

On reflecting the skin flaps the frontal bone may show no change. Usually, however, there are many small hemorrhagic spots. In cases of some weeks standing the surgeon usually finds an area of bone necrosis. This he expects because the x ray film has shown it.

**Removal of the bone flap.** For the removal of a large piece of bone marking out the bone flap by a series of trephine holes made by an electric burr and connecting them by the Gigli saw or a rongeur is the quickest and most craftsmanlike method (Fig. 3). At first it appears difficult to free the bone flap from the superior longitudinal sinus; however, experience has shown that slow dissection will readily accomplish this without tearing of the sinus.

When however the dissection is difficult because of a marked hewing of the frontal bone and the large size of the bone flap, half of the bone flap should be sacrificed up to the longitudinal sinus; the periosteal elevator can then get a straight shot; the operator sees better what he is doing, and the bone flap is more easily and safely freed.

When a trephine opening is made in the frontal bone either to outline the bone flap or for diagnostic purposes and pus wells up from the diploe in quantity there is an extradural abscess. There may be an extradural abscess even if there is no pus in the diploe; therefore all diagnostic trephine openings should be carried through both tables of the skull to the dura.

Patients with osteomyelitis are often in poor condition. It is not uncommon to have to give

a transfusion to the patient on the table. Every thing should be ready for this, including the donor and a separate team to carry out the procedure. In a number of the author's cases the patient suddenly went into shock when the bone flap had been marked out and before its removal. This of course brought the operation to a halt. Recovery from the shock, however, was rapid and a few days later the operation was completed without incident. The lesson from this is that the patient should be carefully watched, should be given full benefit of a transfusion during the operation, if necessary, and as a routine after ward and the operator must be willing to stop when the danger signals appear.

**Time of plastic closure.** Experience has shown that three months is the minimum time which should be allowed to elapse before plastic closure is attempted.

It is foolish to deny that the deformity caused by the removal of the greater part of the frontal bone is not marked and that the median line skin incision does not give a more noticeable scar than incisions covered for the most part by the hairline. However, considerations of this type must be brushed aside as life and death are at stake and good drainage is fundamental when there is sepsis.

The plastic repair of the wound and the closure of the incision diminish the deformity greatly, fully 90 per cent.

**Plastic closure of the wound.** Dr. Kazanjian who is in charge of plastic surgery at the Massachusetts Eye and Ear Infirmary uses the following method in the cases of osteomyelitis.

A strip of bone from 4 to 5 in. long,  $\frac{1}{8}$  in. thick and from 1 to  $1\frac{1}{2}$  in. wide is removed from the inner surface of the patient's tibia. This is scored vertically a few times with a saw so that it can be bent and molded and then placed horizontally in the defect of the frontal bone. The skin flaps are carefully freed and brought into place. Great care is taken to get clean edges and

even more care is used in suturing. To date he has performed closure in 16 cases, and shortly he will close 2 more. Of late, Dr Kazanjian has been freeing the periosteum from the skin flap and suturing it independently of the skin and subcutaneous tissue.

**Regeneration of bone.** In the author's cases the regeneration of bone about the operative defect has been slow. Only 1 has filled in, and that not completely. The results should be more satisfactory now that Kazanjian is using a tibial bone graft to fill in the major part of the defect when he does the plastic repair work. It may be that we have paid too little attention to the periosteum, that is, we have not been careful enough of it at operation, have not freed it from the skin and subcutaneous tissues, and have not sutured it as a separate layer when the plastic closure was done. Dr Kazanjian is doing this now in connection with the use of the massive bone flap from the tibia.

#### CONCLUSIONS

The writer believes even more strongly than he did when he wrote his original paper five years ago that the edema of the skin of the forehead is a rough guide to the extent of the bone and periosteal infection. Furthermore, as was pointed out in that paper, if there is actual bone necrosis, the bone is infected without destruction from 1 to  $1\frac{1}{2}$  in beyond the necrotic area. Bone necrosis does not occur until from seven to ten days after the pitting edema appears, and the x ray is not positive until necrosis appears. The infection spreads along the inner surface of the bone as well as by the diploic veins. When it spreads by a diploic vein it may localize at a point far from the original seat of infection. When it does this, the pus tends to work both inward and outward, and forms either a subperiosteal or an extradural abscess, or both, with destruction of the bone between the two. When the condition has existed two or three weeks, the operator should expect to find one or both of these conditions.

The histological examination of large bone specimens shows in addition that the infection may spread by way of the inner layer of new bone which is formed between the skull and the dura. The small veins which run in the new bone are often infected, and there are numerous hemor-



Fig. 3 Drill holes for removing the frontal bone in one piece

rhagic clots which also are infected. Further, the infection spreads by way of the fibrous tissue which covers the new bone and binds the inner surface of the skull to the dura.

The operator who is doing his first operation on osteomyelitis of the skull should expect extra dural abscesses as a matter of course. In fact, he should expect more than this, he should be on the lookout for a subdural abscess or a brain abscess. The brain abscess, if present, is usually found later, or it comes later as a complication, but it is always threatening, and should be watched for even at the first operation.

The more the writer sees of osteomyelitis of the frontal bone, the more he believes that the whole surface of the frontal bone should be removed, from the hairline to the eyebrow, as a routine procedure. Preferably, it should be removed in one piece, and the operation should start in clean bone. However, if the patient is in poor condition and there is an area of necrosis, it is justifiable to work from the necrotic area outward, the bone being removed from 1 to  $1\frac{1}{2}$  in in all directions from the necrotic area. Further, both frontal sinuses should be opened, and the anterior and posterior walls of each sinus removed. The author is firmly of the opinion that the lateral limit of the bone flap on each side should be at least the outer angle of each frontal sinus, or, better, the outer angular process of the frontal bone on each side. The objection to this extensive removal is the deformity. However, since it has been proved that fully 90 per cent of this can be corrected by modern plastic surgery, the surgeon should not allow his work to be restricted by the question of deformity. If he does he will lose many of his cases of osteomyelitis of the skull.

# ABSTRACTS OF CURRENT LITERATURE

## SURGERY OF THE HEAD AND NECK

### EYE

Wheeler J M Spastic Entropion Correction *im J Ophth* 1939 22 477

Wheeler describes his operation for the correction of spastic entropion and includes in his article very fine illustrations. He concludes with a description of a substitute operation which ordinarily works very well but which has several disadvantages when compared with the first operation.

The operative field is infiltrated with a 1 per cent solution of novocaine (with or without adrenalin). The magnification of the tissues that results from infiltration with increase of the tissue bulk makes the dissection easier and enables the surgeon to work with greater accuracy than is possible without infiltration. The injection of fluid into the tissue in front of the tarsus and tarso-orbital fascia eliminates the entropion and leaves the lid in good position during the operation.

The primary skin incision is begun about 6 mm from the lower lid margin a little nasalward of the center of the eyelid and is carried in the direction of the lid margin into the zygomatic (malar) region about 1 cm beyond the orbital margin. The skin is then dissected from the orbicularis above and below the incision.

A strip of orbicularis muscle about 4 mm wide is dissected free just below the lower border of the tarsus with a cut end at the outer orbital margin. This strip is left attached at its nasal end at a point a little beyond the center of the lower lid. Next the orbicularis is divided over the zygomatic bone by an incision passing outward and upward and the orbicularis flaps are separated so as to expose the periosteum.

The strip of the orbicularis is put on the stretch and attached to the periosteum. It is sutured to its new position by two 000 chromic catgut sutures. It should be observed that the end of the orbicularis muscle strip is carried not only temporalward but also upward and that the muscle strip is thoroughly taut. As the dissection is a little below the tarsus and the muscle strip is not attached to it, the lid margin is not pulled much out of place laterally but the lower lid receives support.

The skin wound is closed by fine silk sutures either with interrupted ties or with a single subcutaneous suture. The author likes the security and accurate apposition given by the interrupted sutures carried through the flaps very near their cut margins.

The eyelids are covered by a protective tissue such as gutta serena with a thin smear of vaseline. A gauze dressing is applied secured by adhesive

plaster and over this a snug bandage is placed. The dressing should be left on for from five to seven days. After this the skin sutures can be removed and the dressing reapplied to be left in place for a day or two by which time the skin wound will have healed and the transplanted muscle strip will be securely adherent to the periosteum.

The result of this procedure is permanent correction of the spastic entropion without appreciable scarring or other disfigurement. The lid is well supported by the attachment of the muscle strip so that the lid margin is in normal position. Such a result is in contrast to that obtained by skin excision buried sutures or cautery scars which usually fail to have a permanent effect and which pull the lower lid margin downward out of proper place.

LESLIE L. MCCOY, M.D.

Martin H E Cancer of the Eyelids *Arch Ophth* 1939 22 1

The author gives a detailed well illustrated and well organized account of cancer of the eyelids. He says this condition may properly be considered as a subtype of cancer of the skin of the face. Its special significance lies in the fact that unlike other cancers of the skin it is particularly likely to result in serious impairment of a vital function namely that of vision. As anatomical structures the eyelids do not possess well defined limits or boundaries.

The topographic incidence of cancer of the eyelids follows:

- Lower eyelid 54 per cent
- Inner canthus 28 per cent
- Upper eyelid 13 per cent
- Outer canthus 5 per cent

There are few if any subjective symptoms until the lesion has reached a size of 8 or 10 mm or until it has involved the palpebral margin, the conjunctiva or the inner canthus. Pain or marked discomfort is never a prominent symptom and is always absent until wide ulceration and sepsis occurs. The possibility of cancer should be considered when any tumor of the eyelid is present whether it is ulcerated or not.

Cancer of the eyelids is found to be basal celled carcinoma in about 85 per cent of the cases. Adenoid basal celled carcinoma a more malignant and potentially metastasizing tumor makes up an additional 5 per cent. Squamous carcinoma which constitutes the remaining 10 per cent of the total usually occurs in the upper eyelid and in the outer canthus.

Treatment of cancer of the eyelids does not differ materially from that of other cancers of the skin of the face except that the need for precautions to avoid injury to the function of the eye or its adnexa

is directly proportionate to the proximity of the lesion to the eye

The end results for cancer of the eyelids had therefore best be appraised on the basis of the degree of conservation of normal appearance and function after treatment

Cancer of the eyelids is not a highly fatal disease. Even though it recurs, the condition can almost always be cured eventually. In 85 per cent of the series of about 150 cases at the Memorial Hospital the first treatment was successful. About 7 per cent of the patients required more than one treatment either for recurrent cancer in the healed area or for the development of a new lesion in another site in the eyelids. Only about 6 per cent of the patients died of the disease, and practically all of these had squamous carcinoma and succumbed either to local deep invasion or to distant metastases after a period of more than five years. Incompletely controlled basal celled carcinoma of the eyelids or elsewhere about the skin of the face is always a slowly progressive disease. Patients may live from thirty to thirty five years with persistence of this form of the disease and then die of other causes.

In summarizing the author states that cancer of the eyelids is an important subtype of cancer of the skin of the face. The disease is not highly fatal and its significance lies chiefly in the fact that the growth itself or its treatment may result in serious impairment of the vision. A less important consideration is the cosmetic defect. Many smaller lesions may be treated either by irradiation or by surgical excision with acceptable end results. Moderate sized growths are most satisfactorily treated by irradiation. Extensive tumors often require radical surgical excision or a combination of irradiation and surgical excision. **LESLIE L. MCCOY, M.D.**

**Rand C W, Irvine R and Reeres D L. Primary Gloma of the Optic Nerve. Report of a Case. Arch Ophth 1939 21 799**

The authors give a very complete and well illustrated account of primary gloma of the optic nerve, together with some very helpful suggestions as to treatment. Their experience leads them to make the following conclusions:

Gloma of the optic nerve is rare, less than 300 cases having been reported, and of these 75 per cent occurred in the first decade of life. In a high proportion of cases there is extension of the tumor into the cranial cavity.

The authors present their clinical and pathological observations in one case of this condition. The suggestive diagnostic signs are the ophthalmoscopic appearance of atrophy of the optic nerve or of optic neuritis, slowly progressive non-pulsatile exophthalmos and enlargement of the optic foramen, as seen roentgenographically.

The polar spongioblastoma is the invariable type of gloma that is found to involve primarily the optic nerve. Since from an embryological standpoint, the optic nerve contains all the adult forms of neuroglia,

it is logical to presume that advanced glial tumors will be reported in the future as more of these neoplasms are discovered and studied with differential staining methods.

Intracranial extension of gloma of the optic nerve occurs more frequently than is usually appreciated as judged by the prevailing attitude of the ophthalmic literature regarding treatment of these growths. The unjustifiable hazard involved when the surgeon is content with incomplete orbital removal is not sufficiently realized.

A gloma of the optic nerve usually grows slowly and orbital recurrence, even after incomplete orbital removal, has not been reported. In spite of this fact, however, extension along the proximal nerve to the optic chiasm may occur. This would imply a fatal prognosis. If such extension is to be prevented, complete removal of the involved nerve is necessary. Technically, complete extirpation is more certain and meningitis is less likely to occur if operation is done through the intracranial approach. Considering the incidence of meningitis following the orbital approach, the intracranial approach cannot be considered a radical procedure since it minimizes the possibility of meningitis.

Roentgenograms of the optic foramen should be made in all cases in which a tumor is suspected. The finding of an enlarged optic foramen is a specific indication for intracranial section of the nerve with removal of the intra-orbital portion of the nerve at the same time.

When there is clinical evidence of intracranial extension, early intra-orbital removal of the involved nerve is recommended. If all of the tumor tissue has been removed, further operation is not indicated. Should invasion of the stump by neoplastic tissue be found, intracranial section of the optic nerve at the chiasm and entire removal of the stump should be carried out. **LESLIE L. MCCOY, M.D.**

## EAR

**Hall C. Brain Hernia. A Postoperative Complication in Otolaryngology. Ann Otol, Rhinol & Laryngol 1939 48 291**

The term "brain hernia" as employed by the author denotes a herniation of meningeal and brain substance through a defect in the dura mater and into the mastoid wound. Postoperative hernias in otological surgery may be divided into two groups: immediate hernias which occur immediately upon incision of the dura and secondary hernias, which occur from two to several days after the dura has been opened. The mastoid operation produces the opening in the skull but two other conditions must be present for the production of brain herniation: an opening in the dura and an increase in intracranial pressure. It is essential that these conditions co-exist as the presence of one alone is insufficient to produce a hernia of brain substance.

The opening in the dura results either from trepanation for brain abscess or from accidental injury,

usually occurring during surgical treatment of a diseased lateral sinus. The increase in intracranial pressure does not result from an increase in spinal fluid formation but from an increase in the brain volume. The increase in brain volume is either a mechanical increase resulting from the volume of the abscess or tumor or an edematous increase resulting from infection or irritation.

Immediate herniation upon incision of the dura is evidence of a mechanical increase in the brain volume and thus usually presumes the presence of abscess or tumor. Secondary postoperative hernias may be divided clinically into three groups: those in which an abscess is present, those in which trepanation for abscess is negative, and those in which secondary hernia occurs in association with lateral sinus disease. In the cases following accidental opening of the dura or those in which no abscess is found upon trepanation, two factors individually or together may produce such a hernia: (1) infection extending in from the already infected mastoid cavity, and (2) edema resulting from the pressure of dressings and from other irritating trauma.

The terminations and possible complications of this entity are healing sphacelation or sloughing, hemorrhage, adhesions between the reduced hernia and the scalp covering it, abscess formation in the hernia, diffuse encephalitis, and inclusion of the ventricle in the brain. The early treatment of a brain hernia should be directed toward the avoidance of trauma, the prevention of infection, and the lowering of intracranial pressure.

NOAH D. FABRICANT, M.D.

## MOUTH

**Roux Berger, J. L. and Tailhefer, A.** Cancer of the Mobile Part of the Tongue: Treatment of the Involved Glands (Cancer de la partie mobile de la langue. Traitement des adénopathies). *Idem* *J. Acad. de chir.* Par. 1939, 65, 835.

Roux Berger and Tailhefer review the results of treatment of the involved glands in 494 cases of cancer of the tongue treated from 1920 to 1933 inclusive at the Cune Foundation. A very careful follow up of patients has been made and only from 1 to 2 per cent have been lost. In the period since 1919 in which these 494 cases of cancer of the mobile portion of the tongue have been treated, three different methods of treating the regional lymphatic glands have been employed: radiation alone, combined surgery and radiation, and surgery alone.

Among 185 cases in which the glands were treated by radiation alone, there were 35 five year cures (19 per cent); in 21 of these there was no clinical evidence of glandular involvement, and in the remaining 14 there was some enlargement of the submaxillary or other regional glands without evidence of malignancy. Among the 150 cases in which the patients had died, there were 21 with recurrence in the tongue alone and 108 with recurrence in glands

in 79 of the latter there was also a recurrence of the growth in the tongue. 5 cases showed metastases.

In 40 cases in which there was no clinical evidence of involvement of the glands and the glands were not excised or irradiated, there were 15 five year cures (34 per cent) and 45 deaths. Among the deaths there were 13 cases with recurrence in the tongue alone and 31 cases with recurrence in the glands. In 16 of the latter the recurrence also involved the tongue. In 39 cases in which clinical examination showed some enlargement of the glands but no treatment of the involved glands was possible for various reasons, there were 4 five year cures (10 per cent) and 35 deaths; there were 10 cases of recurrence in the tongue and 18 cases of recurrence in the glands. In 50 per cent of the latter the recurrence also involved the tongue.

In 54 cases which were operated upon, the glands removed at operation were examined histologically. If no evidence of carcinoma was found, no irradiation was given, but if there were any malignant changes the operative field was irradiated, generally with radium. In 18 of these 54 cases there was no clinical evidence of glandular enlargement, yet histological examination showed carcinomatous involvement of the glands in every instance; there were 4 five year cures in this group (22 per cent) with combined surgical and irradiation treatment. Of the 36 cases in which clinical examination showed enlargement of the regional glands, the glands were found to be histologically carcinomatous in 34 cases; in this group there were 6 five year cures (16 per cent), 5 cases with recurrence in the tongue, and 18 cases with recurrence in the glands. In 11 of the latter the tongue was also involved.

In 100 cases surgical removal of the regional glands was done without postoperative irradiation. In 42 of these the glands showed no clinical evidence of involvement, yet histologically they were carcinomatous in 15 cases. There were 19 five year cures in this group (45 per cent) with 5 cures among the 15 cases in which the glands were involved. In 58 cases clinical examination showed enlargement of the glands and histological evidence of carcinoma was found in 27. There were 19 five year cures in this group (33 per cent); 4 of them among the 27 cases in which the glands were carcinomatous. Among this group of 100 cases in which the regional glands were treated by surgery alone, there were 38 five year cures or 38 per cent; 9 of these cures occurred in cases in which the glands were histologically invaded. In 33 of these 100 cases there was a glandular recurrence with associated involvement of the tongue in 17.

In 46 cases the regional glands were not treated until five months or more after treatment of the primary growth in the tongue was completed. Twelve of these cases were treated by radiation alone with recurrence in all cases and no cures. Twenty two cases (all with proved involvement of the glands) were treated by surgery plus irradiation with 4 five year cures (18 per cent). Twelve cases



were treated by surgery without postoperative irradiation, with 2 five year cures (16 per cent), in both of these cured cases there had been proved involvement of the glands

These findings indicate that operation is necessary for cure when the glands show carcinomatous involvement, postoperative irradiation does not appear to play an important role in such cases. Surgical removal of the regional glands in cancer of the mobile portion of the tongue has been adopted as the routine method at the Curie Foundation in the last five years

ALICE M. MEYERS

Newell E. T. Jr. Carcinoma of the Lip. A Clinical and Pathological Study of 390 Cases with Report of the Five Year Cures. *Arch Surg* 1939 38 1014

The author presents a clinical and pathological study of 390 cases of carcinoma of the lip. Diagnosis was made from the microscopic examination in all but 10 patients who were victims of hopeless carcinoma. There were 344 cases of squamous cell carcinoma, 44 cases of basal cell carcinoma, and 2 cases of adenocarcinoma. Only 2 per cent of the basal cell lesions and none of the adenocarcinomas occurred on the lower lip. The total number of malignant lesions on the lower lip was 336, and the total number of malignant lesions on the upper lip was 54. "Malignant wart" is a term used to indicate the papillary squamous cell low grade type of carcinoma.

Illustrations are shown to emphasize the fact that clinically a lesion cannot always be diagnosed as benign or malignant. Emphasis is placed on the microscopic study with relation to prognosis and therapy.

Patients whose cases had been followed for a period of five years were selected as giving the best index to the results from treatment, 328 of the 390 were available. The percentage of five year cures in the entire series was 61.6. The incidence of metastasis or recurrence on first examination was 36.4 per cent.

The results of treatment are reported as follows:  
Group 1. One hundred and seventy six patients with no clinical evidence of metastasis upon whom local excision alone was performed. The percentage of five year cures was 80.9, and there were no operative deaths.

Group 2. Ninety patients without microscopic evidence of metastasis upon whom local excision plus dissection of the cervical glands was carried out. The percentage of five year cures was 85.3, and there were 4 deaths.

Group 3. Eighty three patients with metastasis upon whom both local excision and cervical gland dissection were done. The percentage of five year cures was 22.5 and there were 8 operative deaths.

In these 349 cases the operative mortality was 3.7 per cent.

A comparison of the five year results in the literature from operation, irradiation, and dermatological

methods (cauterization) shows that operation compared favorably with the other methods.

Judging by the results obtained in the author's series of cases, it would seem that in a selected group of cases with a high grade of malignancy, invasion of the deeper structure of the lip, and with or without clinical evidence of metastasis, dissection of the glands of the neck is a wise procedure.

JOSEPH K. NARAT, M.D.

Anderson B. G. Epulis. A Series of Cases. *Arch Surg*, 1939 38 1030

The various types of epulis, classified according to their characteristic histological structure, may represent different stages of development of the same growth. In this series of 20 cases, only the younger epulides, found in the younger patients, contained giant cells. The older epulides found only in patients in the third decade of life or beyond, contained regular laminated trabecular bone. This type of osseous structure, in all but one instance, followed a prolonged masticatory stress. The majority of patients stated that the epulis began with a local mechanical injury to the place of origin. In most of these the injury was caused by a carious or broken down tooth.

Indications for the extraction of teeth displaced by the tumor may be determined partly by the direction of displacement.

JOSEPH K. NARAT, M.D.

## PHARYNX

Grodinsky, M. Ludwig's Angina. *Surgery*, 1939, 5 678

Eighty six articles (from 1769 to 1938) including the original article by Ludwig in 1836 have been reviewed. The consensus of opinion is that if the term "Ludwig's angina" is to be retained it should be used in reference to a specific clinical entity and not to a variety of conditions similar only in minor points or in their end results. It is believed that the term "Ludwig's angina" should be reserved for those cases of infection starting in the floor of the mouth usually from carious lower molar or bicuspid teeth spreading to the submental and submaxillary triangles (submandibular space) by fascial planes, and causing serious symptoms from edema of the tongue and glottis, mediastinitis, or toxemia.

The following points were emphasized by Ludwig in 1836: (1) the comparatively slight inflammation of the throat itself; (2) the peculiar woody hardness of the cellular tissue on which an impression cannot be made; (3) the hard swelling under the tongue and the swelling of the floor of the mouth on the inner side of the mandible; (4) the well defined border of hard edema in the neck; and (5) the absence of infection in the regional lymph nodes.

The normal anatomy of the head and neck is reviewed with a description of the fasciae and fascial spaces of the head, neck, and adjacent regions based on the study of 75 adult cadavers and 5 full term fetuses by dissection, injection, and section methods.

## NECK

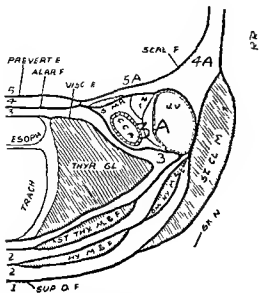


Fig. 1. Diagrammatic drawing of fascia of the neck. The transverse section is approximately at the level of the sixth cervical vertebra.

The pathogenic bacteria gaining access to the floor of the mouth are usually the common pyogenic streptococci and staphylococci; but other mouth inhabitants such as Vincent's organism and the spirochete group may be primary or secondary invaders. The majority of cases of true Ludwig's angina occurs in adults.

The clinical course begins with a swelling of the gums about the lower molar teeth which may or may not be accompanied by pain and fever and may be preceded by a chill. An external swelling soon appears which involves only the submaxillary triangle on the side or may start in the midline in the submental region. There is elevation of the floor of the mouth and the tongue and difficulty in opening the mouth, speaking and swallowing. If this is not treated properly it soon spreads across the midline to the other side superiorly over the face and inferiorly to the sternum and clavicle.

The treatment consists in early and adequate drainage which offers the best hope of relieving pressure and preventing extension of the infection. A discussion of the incisions which may be used to best advantage is given, but a combination of sharp and blunt dissection is the safest.

Four case reports are given in abstract showing the results of the improper and proper methods of treating this type of infection.

Death from Ludwig's angina occurs either from suffocation due to edema of the floor of the mouth, tongue and glottis or from mediastinitis due to spread through the afore mentioned spaces. Septicemia and aspiration pneumonia may be terminal.

RICHARD J. BENNETT, JR. M.D.

**Woytek G. Thyrogenic Liver Injury and Thymus Function (Thyreogene Leberschädigung und Thymusfunktion) 63. Tag d. deutsch. Ges. f. Chir. Berlin 1939.**

On critical examination of six years autopsy reports from Sauerbruch's Clinic on patients with Basedow's disease who died during the period of postoperative reaction two findings relating to the organs claim attention because of the frequency with which they appear. They are (1) thyrogenic injury to the liver and (2) persistence of the thymus or status thymolymphaticus. They were found in 70 per cent of the autopsies. Clinically the organic injury to the liver often remains latent. Function tests fail to show it. However a liver which arouses no suspicion clinically may show surprising functional defects under certain conditions. One must therefore at least in all the more severe cases of exophthalmic goiter assume from the beginning that a thyrogenic injury to the liver exists and proceed accordingly. Practically this means that in the medicines prescribed pre-operatively and in the choice of the anesthetic everything which would make demands on the detoxifying function of the liver must be avoided. Avertin previously much used has been abandoned by the author because of disastrous experiences; fatalities occurred in cases of patients with clinically latent thyrogenic liver injury, the patients dying without awakening from the avertin sleep. Also treatment of the organic injury to the liver should be an integral part of the pre-operative management of the patient with Basedow's disease. Dextrose should be given by mouth in large quantities as in this manner all of the dextrose passes immediately to the liver by way of the portal vein. Insulin should not be given since it would not increase the glycogen of the liver but would tend to reduce still further the capacity of the liver to form glycogen from dextrose which has already been lowered by thyroxin. Vitamin C should be given in large quantities for its dual action of (1) checking the decomposition of glycogen in the liver which is stimulated by the hormone of the thyroid gland and (2) putting a stop to the creatinuria or breaking down of glycogen in the muscles which is unaffected by insulin and thus increasing the diminished functional capacity of the myocardium. A change should be made in the usual method of preparation of the iodine to be used since the restoration of liver function requires a certain amount of time. The usual massive iodine effect of brief duration is not appropriate because it could easily bring about the dreaded phase of reversal before the treatment of the organic lesion of the liver had produced the optimal conditions.

Recent acquisitions to our knowledge make it appear certain that the influence of the thymus enters largely into the total disease picture of Basedow's disease and the postoperative phenomena. The endocrine function of the thymus gland is

histologically recognizable in certain characteristics of the organic structure. Clinical experiences show that the functioning of the thymus may be demonstrably independent not only of the age of the bearer but also of the size of the organ. Thymus tumor or thymus hyperplasia is not necessary in the anatomical picture. The importance of the thymus cannot be judged exclusively from its size or its weight.

The demand for combined thyroid and thymus resection in Basedow's disease must be held to certain limitations. Clinically there are various factors which tend to keep it within the realm of the problematical (atypical localization—epiphrenic or epicardial site of a segment of the thymus which substitutes functionally for the excised portion). The general importance of the thymus in postoperative even comatose, conditions following struma resection is modified by the fact that the oral administration of dextrose may be a life saving measure in these cases. The myasthenic reaction is useful in determining the question whether or not resection of the thymus should be included with that of the thyroid. Above all it is difficult even with this test to decide before operation just how important a role the thymus plays in the total disease picture. From illustrative instances selected from practice it is easy to recognize the multiplicity and wide variety of the relations of the thymus to Basedow's disease. Further clinical work is required before the indications for combined strumectomy and thymus resection in Basedow's disease can be stated clearly and definitely. (Woytek). FLORENCE A. CARPENTER

**Lahey F. H. The Technique of Subtotal Thyroidectomy.** *Surg. Clin. North Am.* 1939 19 565

The technique which the author describes embodies the principles of subtotal thyroidectomy which were followed and modified in some 18,000 operations on the thyroid.

The incision is placed so that a string of beads will hang over it and the upper edge must be elevated well above the thyroid cartilage. The edge of the sternocleidomastoid muscle is pulled back, and the prethyroid muscles are separated back under the sternocleidomastoid muscle and caught in high clamps. The high division of the muscles preserves their innervation. The hypoglossus muscle is preserved, the gland is rotated inward and the superior thyroid artery and vein are exposed. The special corkscrew shaped ligature passer is passed beneath the vessels above the point where they enter the gland, then the middle thyroid vein is severed. The lateral lobe is rotated inward and the posterior surface visualized. The objection to this procedure, that it stretches and injures the recurrent laryngeal nerve is invalid. Over a row of hemostats the lateral portion of the gland is removed, then the isthmus is exposed and removed together with the pyramidal lobe, which leaves the trachea bare.

After the removal of both lateral lobes, the hemorrhage is controlled the lobes are turned inward and

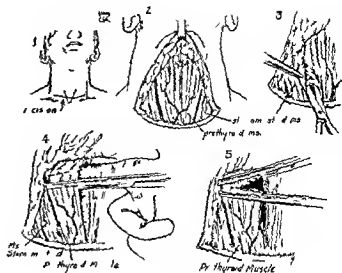


Fig. 1

the oozing surfaces so buttressed against the trachea that oozing is controlled. If necessary, a piece of muscle is sutured with catgut over a bleeding point. The muscles are sutured high above the skin suture line. The platysma is not closed and subcutaneous sutures are avoided. The skin is closed without drains by clips, half of which are removed the second and half the third day.

The major disasters of this operation are hemorrhage, and injury to the parathyroids, the laryngeal nerve or the trachea which can be avoided by adequate exposure. FRED S. MODERN, M.D.

**Wells H. Protection of a Segment of the Nerve during Thyroidectomy.** (*Le repérage du récurrent par dissection d'un segment du nerf au cours des thyroïdectomies*). *Mém. Acad. de chir.* Par 1939 65 615

Wells notes that protection of the recurrent nerve during thyroidectomy is of importance as bilateral injury to this nerve has serious results. If the nerve is cut or injured it is difficult to repair it satisfactorily. The usual methods adopted for protection of the nerve are to leave a portion of thyroid tissue of sufficient thickness in the posterior part of each lobe to obtain perfect hemostasis throughout the operation in order to avoid any concealment of the operative field by blood, and to test the ability of the patient to speak during the operation which can be done with modern methods of local anesthesia. These measures give considerable security, as in 1,976 thyroid operations on 1,715 patients in the period from 1927 to 1939 the author has not had a single case of bilateral paralysis of the recurrent nerve. However, he is of the opinion that the recurrent nerve is not absolutely protected by any of these measures.

Since October 1938 the author has dissected and demonstrated the course of the recurrent nerve in

250 thyroidectomies including 169 operations for toxic goiter. In order to expose the nerve satisfactorily the subhyoid muscles are cut not only longitudinally but also transversely; there is no undesirable effect from the esthetic point of view if they are carefully sutured. The procedure of exteriorization of the goiter is carried out as usual before exposure of the nerve. Care must be taken not to extend the operation too far backward; at the upper pole the inferior cornu of the thyroid cartilage must be left intact. The operation must not be extended too far along the inner surface of the lower pole and in liberation of the thyroid from the trachea the lateral surface of the trachea must not be stripped too far backward. After exteriorization of the goiter the posterior segment of the lateral lobe is exposed with avoidance of excessive traction.

The recurrent nerve is located at two points: above in the region where it enters the larynx and below where it crosses the inferior thyroid artery. From

these two points the course of the nerve can be determined without further dissection. At the upper point it is usually sufficient to locate the nerve by palpation of the inferior cornu of the thyroid cartilage; actual dissection is not necessary at this point and might be dangerous because of possible damage to the upper parathyroid. At the lower point the nerve is easily exposed by gentle blunt dissection of the cellular tissue in the region of the thyroid artery; slight traction on the artery, especially on the right side, may facilitate the procedure. This procedure is indicated in cases of total thyroidectomy; in cases of toxic goiter in which an extensive subtotal thyroidectomy must be done to prevent recurrence of symptoms; in less extensive thyroidectomy when palpation of the inferior cornu of the thyroid cartilage and the topography of the posterior border of the lateral lobe indicate the possibility of injury to the recurrent nerve; and in thyroidectomy for the racic goiter.

ALICE M. MEYERS

# SURGERY OF THE NERVOUS SYSTEM

## BRAIN AND ITS COVERINGS, CRANIAL NERVES

**Brunel M** Tumors of the Medulla Oblongata (Les tumeurs intra bulbares) Thesis of Paris Abstr by Rouques *Presse méd*, Par 1939, 47 1021

Brunel notes that tumors of the medulla oblongata are one of the rarest types of cerebral tumor. They are usually gliomas occurring in young adults. Contrary to what might be expected, they do not cause many symptoms. The symptoms at onset are variable, the tumors develop slowly, signs of increased intracranial pressure are few and develop late. Certain functional disturbances are of importance especially if they develop early, these are vomiting and regurgitation hiccough, changes in the respiratory rhythm and especially variations in the pulse rate, such as temporary rapidity or slowing up of the pulse. Combined with such symptoms, paralysis of the cranial nerves are the most important sign of the lesion, but such paralysis may develop late and are not always observed. They are usually unilateral, although the tumor involves both sides. There are no systematized cerebellovestibular symptoms, and tests of vestibular function give no definite information. Involvement of the vegetative nerve centers is unusual. Examination of the spinal fluid shows nothing of interest except a dissociation between the albumin and the cell count. Diagnosis is, therefore, rarely made.

The medulla oblongata appears to be remarkably tolerant of tumor growth. The tumor may extend into the pons or into the spinal cord in some cases such tumors are found to be associated with syringobulbia.

If the diagnosis can be definitely established, surgical treatment is contraindicated, roentgen therapy may be of aid.

Alice M. Meyers

**Henderson W R** The Pituitary Adenomas *Brit J Surg* 1939 26 811

A complete abstract of this 110 page article would be impossible but the work is of such interest that brief mention may be made of certain important points. The cases of 338 patients with pituitary adenomas are reviewed. The most recent of these were operated on at least five years ago. All were surgically treated by Cushing since 1912. The material was made up of 260 chromophobe adenomas, 67 acidophil (chromophil) adenomas, and 11 adenocarcinomas. The article is concerned primarily with surgical results and this accounts for the small number of acidophil tumors under discussion for many more were observed but were not treated by operation. The incidence of pituitary tumors with relation to that of other histologically verified brain tumors is 17.8 per cent.

The two operative methods are discussed the old transsphenoidal method, and the newer transfrontal or osteoplastic approach. With the lowering of the mortality rate in intracranial surgery, the transfrontal method was practically always used, preliminary ventriculography was occasionally employed in doubtful cases. Of 260 patients with chromophobe adenomas 167 had transsphenoidal operations with 8 fatalities, and 93 had intracranial operations with 5 fatalities. The deaths following operation by the transsphenoidal method were due mostly to meningitis, those following the transfrontal method of operation occurred as a result of the formation of extradural blood clot, or cerebral edema. The early results of operation have to do principally with vision, and on this basis there is little choice between the two methods of procedure. With regard to late results, these should probably be judged by recurrences. The transfrontal operation combined with x ray therapy gives the best results after a period of five years. The percentages of patients without recurrences after five years are as follows:

Thirty two and eight tenths per cent of those operated upon by the transsphenoidal method, 57.5 per cent of those operated upon by the transfrontal method, 65.3 per cent of those operated upon by the transsphenoid and x ray method, and 87.1 per cent of those operated upon by the transfrontal and x ray method.

Although x ray therapy is a very valuable method of treatment, especially in the chromophil adenomas, its use should not be continued too long before operation unless improvement in vision is noted. Time may be lost and serious damage may be done to the optic nerves. Postoperative x ray therapy is advised. It has been found to have an important place in the treatment of recurrences—the aim of treatment in any case being to restore vision not to prevent blindness.

The acidophil (chromophil) adenomas present a different picture in which spontaneous remissions may play a part. The systemic disturbances are more serious because of the effect of excessive pituitary secretion on the cardiovascular system and on sugar metabolism. These tumors are more amenable to x ray treatment, but if loss of vision is threatened operation should be performed. The operative mortality in acidophil (chromophil) adenomas is slightly higher than in the chromophobe adenomas.

The extraordinary mortality rate in this remarkable series (5.3 per cent for transsphenoidal and 4.5 per cent for intracranial operations) must be given especial mention. It was possible to reduce it to 2.4 per cent during the last ten year period from 1922 to and including 1931.

Adrien Verbruggen, M D

**Cairns H Bacterial Infection During Intracranial Operations** *Lancet* 1939 236 1193

The author has studied the incidence of infection of 968 intracranial operations. There were 23 deaths from infection. The fatal cases included infections from the staphylococcus albus and aureus streptococcus diplococcus mucosus micrococcus tetragenus a bacillus of the Sonne type and gram negative bacilli hitherto regarded as harmless to man.

Scalp infection after an intracranial operation is not necessarily serious. It occurs usually only when the blood supply of the wound edges is impaired. Suture of the galea aponeurotica by interrupted silk stitches obviates tight skin stitches. Broadening of the pedicle of the skin flap (Fig 1b) gives more uniformly good skin healing than the old type of flap (Fig 1a) which occasionally showed necrosis of the skin at the anteromedial angle. In prolonged operations the scalp may become infected as a result of constriction of its blood supply by the weight of the clamp applied to the galea. This occurs particularly in the middle line of the forehead where the scalp is less vascular and the galea more fragile than elsewhere. The remedy is the simple one of removing the clamps.

Osteomyelitis is a rare variety of postoperative infection. It may be primary or secondary to scalp infection or it may arise from perforation of the frontal sinus during operation.

Streptococcal droplet infections are serious and usually fatal. They can be prevented by the use of a mask consisting of a thin layer of cellophane between two layers of gauze. This mask allows air to escape at the sides but the droplets from the mouth are caught in the gauze.

In a case of hydrocephalus in a young child the simple operation of cerebellar decompression was followed by a fatal purulent meningitis due to a bacillus of the Sonne type. In all probability it came from the saline solution used in the operation. It has also been discovered that bags of powder used for the hands and gloves may contain living organisms. In order to sterilize these bags of powder completely prolonged dry heat should be used, as moist heat cannot penetrate to the center of the bag of powder.

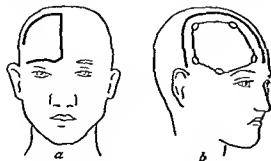


Fig 1 Frontal scalp flaps (a) old type (b) new type

The case of auto-infection included is that of a patient who is operated on for some intracranial lesion while suffering from streptococcal infection of the throat and then develops a streptococcal meningitis. The use of sulphonamide compounds is clearly indicated as a prophylactic in cases of this type that require operation urgently. Another type is that with intensification of an unrecognized pre-existing meningeal infection.

Low grade air borne infections occur particularly after removal of tumors from the posterior fossa. They are slow in onset and the preliminary manifestations consist usually of slight fever and pleocytosis of moderate degree. The staphylococcus albus micrococcus tetragenus, and other saprophytic organisms can usually be cultured from the spinal fluid. The result of this low grade infection is not a pyogenic infiltration of the meninges but rather an adhesive meningitis. The bacterial content of the operating room atmosphere is of considerable importance in these infections. Hart has found that the number of bacteria in the atmosphere varies directly with the number of people present.

The measures for prevention of intracranial infection include systematic checking of the efficiency of sterilizing and operative technique methods to diminish the bacterial content of the operating room adequate masking of the people in the operating room the administration of sulphonamides before operation in certain cases conservation of the blood supply of the scalp and conservation of the arachnoid membrane in operations involving the basal cisterns.

DAVID J. LIPKASTADT M.D.

**Hindman O R and VanEpps C The Possibility of Differential Section of the Spinothalamic Tract A Clinical and Histological Study** *Arch Surg* 1939 38 1036

The authors of this article have done 41 chordotomies during the past few years. 6 of them under local anesthesia. Their results have led them to question the accepted localization of the pain conducting and temperature conducting pathways in the spinal cord of man and they see in their concept of the spinothalamic tracts a means of performing a differential section to abolish pain and temperature sensibility in isolated areas of the body.

First they believe that the important landmark for the surgeon the dentate ligament is not so placed as to indicate coronal halves of the cord. Rather they believe the plane of the ligament passes nearly through the junction of the posterior third of the cord with the anterior two thirds. Also they hold that the line formed by the anterior roots is slightly more than half the distance from the dentate ligament to the anterior median fissure. As low as the fifth thoracic segment at least they found the spinothalamic tract to extend further anteriorly than the line of the anterior roots.

These authors performed all of their reported chordotomies under the second or third thoracic laminar arches. They localize the spinothalamic

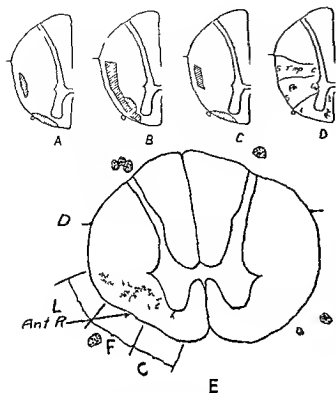


Fig 1 Diagrammatic representations of the spinothalamic tracts as given by several authors. 1 drawing taken from Gray (Gray H. *Anatomy of the Human Body* ed 20 edited by W H Lewis Philadelphia Lea & Febiger 1918 p 759). B drawing taken from Tilney and Riley (Tilney F and Riley H A. *The Form and Functions of the Central Nervous System* New York Paul B Hoeber 1923 p 196). C drawing taken from Ranson (Ranson S W. *The Anatomy of the Nervous System* Philadelphia W B Saunders Company 1920 p 110). D drawing taken from Foerster. E authors' concept of the tract made from a tracing of figure 4 A. L fibers probably representing the lower extremity F fibers representing the groin and abdomen C fibers representing the chest D dentate ligament Ant R line of anterior roots.

tract for pain between a point midway from the dentate ligament to the anterior roots and a point midway from the anterior root to the anterior median fissure. Complete section should include this entire region and such a section should result in complete loss of pain in the contralateral side beyond the next lowest three or four segments. The region extending 2 mm anterior to the dentate ligament contains no fibers conducting sensations of pain or temperature (Fig 1). There is a laminated arrangement in the tract, inasmuch as one progresses from the lower segments of the body upward the corresponding spinothalamic fibers are placed progressively more anteriorly in the cord. This arrangement being true it is possible by differential section of, for instance the anterior portions of the tract to abolish pain in the chest and to retain all modalities of sensation in the lower extremities. Their results in alteration of touch sensa-

bility is interesting. They made numerous deep sections extending to the anterior median fissure, and in no case could they elicit any loss of touch or deep pressure sensibility in two point discrimination or in the sense of position. JOHN MARTIN M D

## PERIPHERAL NERVES

Scaglietti O. *The Surgical Treatment of Traumatic Lesions of the Peripheral Nerves* (Trattamento chirurgico delle lesioni traumatiche dei nervi periferici). *Chir d'organi di movimento* 1939, 24: 391.

This report is based upon the author's experience in treating traumatic lesions of the brachial plexus, radial, ulnar, and median nerves, and the sciatic nerve and its branches. His statistical report indicates that he has had his best results with the radial nerve, in the upper extremities, his results with the ulnar, median, and brachial plexus have been in the order named successful in a lesser degree. He admits that the surgical results in a large series of peripheral nerve operations are difficult to evaluate, as each case presents features not found in a similar case.

Peripheral nerve injuries should, at the very earliest opportunity, be subjected to a thorough clinical examination, with an attempt to determine the extent of injury, the actual anatomical destruction, and the surgical treatment of choice. Such a study should include a careful electrical examination, since such tests have been valuable, in the hands of the author, in the determination of the extent of the injury and identification of the nerve involved. Surgical care is always indicated when the signs of nerve damage are progressive, when there are signs of complete interruption of the nerve trunk, and when there are no signs of spontaneous restoration of function. The choice of procedure may be particularly difficult to decide when the nerve has been damaged in a fractured extremity. The author's experience bears out the advice that best results are to be obtained when operation is done at the earliest time possible. Not only is time thus saved to be used in the regrowth of the nerve following repair, but he believes that return of function will be more satisfactory if the suture can be accomplished before the distal segment has undergone very marked degenerative change.

Scaglietti prefers to use a general anesthetic for all peripheral nerve operations. Perfect hemostasis is an essential. The neuroma is to be completely removed, neurolysis is to be thorough, end to end suture is to be preferred and when impractical an auto graft is to be used, and silk is the suture material of choice. The limb should be immobilized up to thirty to forty days to allow complete healing of the suture line. This is especially necessary when the nerve has been transplanted or when it has been necessary to flex a joint in order to effect the suture. The intelligent use of physical therapy constitutes an important part of the postoperative care.

JOHN MARTIN M D

Dejardin L. and Jonckheere F. *The Surgical Repair of the Peripheral Nerves of the Extremities* (La chirurgie réparatrice des nerfs périphériques des membres) *Bruxelles méd.* 1939 19 896 928

On the basis of a small personal series of peripheral nerve injuries and the information resulting from a questionnaire sent to colleagues the authors have formulated their ideas concerning (1) the pathology of and (2) the surgical treatment of peripheral nerve injuries. They make no attempt to report any results of such treatment.

Quoting Larat and Lehman they find that in a series of 1,500 cases the percentages of injuries for certain nerves were: radial 27 per cent, median 18 per cent, ulnar 18 per cent, brachial plexus 2 per cent, peroneal 14 per cent and tibial 7 per cent. Lesions wherein the nerve is not exposed or grossly interrupted in its anatomical continuity may occur as the result of: (1) laceration of the nerve as when during injury to the elbow the ulnar nerve is forced from its groove; (2) contusion as in a fracture of the humerus with contusion of the radial nerve; (3) elongation as may happen in dislocation of the shoulder or hip; and (4) traumatic compression as in fractures, aneurysms and arthritis. Gross or exposed nerve injury may take the form of: (1) denudation; (2) perforation which is especially frequent in war injuries; (3) total or partial section of the trunk; and (4) crushing injuries of the nerves.

The treatment of peripheral nerve injuries may be surgical, orthopedic, medical or by means of physical therapy.

The authors have gone into detail to explain the necessity of gentle handling of the tissues, the use of special instruments, the value of complete toilet and hemostasis of the wound, the thorough freeing of the nerve and careful resection of the neuroma, the accurate perineural suturing of the nerve ends and the superiority of silk as a suture material. They have attempted to evaluate in condensed form the use of autografts, heterografts and the Mayo Robson graft bridging with catgut tendon silk or other foreign material and the use of tubes of various materials. They seem agreed that the end-to-end suture is always to be hoped for and that manipula-

tion of the extremity must be thoroughly tried to accomplish such a suture. This being impossible an autograft should be used. They place some faith in heterografts and the Mayo Robson method of making a spinal cord graft.

JOHN MARTIN M.D.

### SYMPATHETIC NERVES

Ascroft P. B. *The Surgical Treatment of Arterial Hypertension* *Lancet* 1939 237 113

The author of this paper is a surgeon but he is obviously not too enthusiastic over or too impressed by the results of operative treatment of hypertension in large series of cases in three or four American clinics. In a brief but adequate review he presents the current arguments for the support of the renal theory which he tends to accept. He does not believe the causes ordinarily given for hypertension to be valid. He particularly looks askance at the nervous theory as it is commonly conceived and he therefore doubts the value of splanchnic de-innervation operations when used alone. He recognizes that splanchnic nerve section (his operation of choice when operation is indicated) may cause the pressure to fall at least for a time in some patients or it may be without effect.

He states it may be postulated that in the early stages of essential hypertension blood flow to the renal tissue is reduced by constriction of the renal blood vessels especially afferent glomerular arterioles by nervous impulses. This causes excessive production of renin which enters the blood stream causes generalized vasoconstriction and raises the blood pressure. If splanchnic section is undertaken at this stage the renal arteries dilate and blood pressure falls. If not structural changes take place in the arteries not only rendering dilatation impossible but also causing further narrowing. More renin is produced a vicious cycle is established and hypertension becomes permanent and progressive.

He recommends wide splanchnic resection only when the hypertension is early and labile and even then he believes results are unpredictable. He suggests nephro-omentopexy in addition to sympathectomy as a means of increasing the renal arterial supply.

JOHN MARTIN M.D.



# SURGERY OF THE THORAX

## CHEST WALL AND BREAST

Ochsner, A. and DeBakey, M. Chōnē Chondrosternon *J Thoracic Surg* 1939 8 469

The authors consider the term 'chone chondrosternon' preferable to those previously used (funnel chest, pectus excavatum, kolisternia, trichterbrust, thorax en entonnoir) for describing the thoracic deformity which may be defined as a usually congenital and rarely acquired depression of the lower portion of the sternum and the adjacent costal cartilages which characteristically becomes progressively more marked as the individual grows.

A brief historical resume is presented in which it shows that the condition was described as early as 1594 by Bauhinus. True chone chondrosternon occurs infrequently. In a collected series of 46705 persons examined there were 28 cases (0.059 per cent) with this deformity. Of 268 collected cases in which the sex incidence was stated 220 (78.1 per cent) were males and 48 (21.8 per cent) were females.

A discussion of the cause and pathogenesis based upon a complete review of the literature is presented and the significant factors are classified into (1) congenital and (2) acquired. The most prominent characteristics of the former are (1) heredity (2) growth disturbances (sternal developmental arrests, costal overgrowth, delayed sternal ossification, muscle contracture and hyperpituitarism) (3) mediastinitis (4) mechanical intra uterine compression, and (5) syphilis. The acquired factors consist of (1) rickets (2) trauma and (3) faulty posture.

The anatomicopathological characteristics of this deformity are reviewed and consist of depression of the sternum and slight rotation on its longitudinal axis usually to the right, a decrease in the antero-posterior thoracic diameter and an increase in the transverse thoracic diameter. There is usually lateral displacement of the heart to the left as well as compression and lateral rotation. The lungs and the esophagus may also be compressed and the diaphragm is usually depressed.

Not infrequently clinical manifestations are absent but in those cases in which they occur the symptoms and signs are likely to reflect cardiac and pulmonary disturbances. Thus, the manifestations consist of dyspnea, palpitation, precordial pain and decompensation, and, rarely, cyanosis, cough and diminished vital capacity. Digestive disturbances such as dysphagia and dyspepsia may also be present. In general, the patients are of asthenic habitus and usually display characteristic weakness and debility. They are likely to have poor resistance to infection and a tendency to acquire bronchitis and tuberculosis.

The various methods of therapy are classified into two groups (1) conservative and (2) operative. The former consists of breathing and postural exercises

and orthopedic measures. Conservative procedures should always be tried, and in the milder forms considerable improvement can be obtained. However, in the presence of definite manifestations of cardio-respiratory disturbances, operative therapy is justified.

Since 1911, when Ludwig Meyer performed the first operation for chone chondrosternon, 32 patients have been operated upon. The various types of operative procedures that have been performed are reviewed and analyzed, and classified into three groups: (1) chondrosternal resection, (2) T sternotomy with or without costal cartilage division and traction, and (3) sternal mobilization and costo-chondral division or resection. There have been 10 operations belonging to the first group with 8 (80 per cent) deaths, 14 operations belonging to the second group with 8 (57.1 per cent) satisfactory results, 2 (14.2 per cent) unsatisfactory results, and 4 (28.5 per cent) deaths, and 8 operations belonging to the third group with 7 (87.5 per cent) successful results, 1 (12.5 per cent) unsatisfactory result, and no deaths.

The first type of procedure, consisting of varying degrees of chondrosternal resection, is considered irrational because even though the structural defect is removed the physiology of respiration is undoubtedly disturbed. The second type of procedure, T sternotomy, has the disadvantages of being extensive and complicated, and may allow recurrence. For these reasons the authors express the opinion that costo-chondral division or resection with sternal mobilization and traction is the operation of choice.

The authors report in detail a case in a white female twenty-one years of age. The operative procedure which was employed was similar (with slight modifications) to the third type of procedure. It is described and illustrated. Examination of the patient approximately one year after operation revealed that the correction of the thoracic deformity had been maintained, and the symptoms were completely relieved.

Caminiti, S. A Contribution to the Study of Mastosis (Contributo allo studio della mastosi) *Arch Ital di chir* 1939 56 198

Mastosis, formerly known as cystic disease of Reclus or fibrosis cystica, is characterized by the presence of cysts of varying size in the breast tissue, one or both breasts may be involved, frequently the breasts are painful spontaneously and upon pressure. The disease most often affects women, usually at the menopause, and is frequently called mastitis of the menopause. From the standpoint of pathological anatomy there are two types of changes: the glandular parenchyma is transformed into cysts of varying number and size, and there is a hyperproduction of periacinal connective tissue with re-



Fig. 1 A nodule of mastosis in advanced evolution

salting sclerosis of the stroma. According to the type of case the epithelial or the connective tissue may predominate. Another characteristic is the presence of eosinophile cells in the epithelial tissue. Schimmelbusch has considered it a form of neoplasm and called it *cystadenoma*.

The author discusses the various theories of pathogenesis thus far proposed, the chief of which have a neoplastic and inflammatory basis. However he favors Lazzarini's explanation that it is a mastosis due to degeneration caused by glandular or endocrine disturbances usually on the part of the ovaries or thyroid glands. The author cites experimental studies in animals in which characteristic breast changes were caused by the injection of folliculin. Occasionally there is a development of cancer in the breasts of patients with mastosis but the author points out that this is to be expected in this age group of female patients and has no correlation with the mastosis.

The author reports on 35 personally studied cases of mastosis which include 34 females and 1 male.

The disease occurs usually in females at the periods of greatest sexual disturbance namely puberty and the menopause; it is more frequent in sterile women than in women who have been pregnant. Seven of the author's patients had amenorrhea, 21 had evidence of disturbed ovarian function, and 12 had signs of hyperthyroidism. In the majority of these cases the breasts were painful; painlessness raises the suspicion of malignancy. In 15 per cent of the cases there was bleeding from the nipple which is not a particularly serious sign; it indicates that fragile capillaries in the cysts or the tubules have ruptured into a nearby lactiferous duct. In 5 of the cases there was involvement of the axillary glands but

this finding was of no particular significance. The superior external quadrant of the breast was most commonly involved. In none of the cases was there fixation to the skin or muscles, nor was there retraction of the nipple.

The 1 male, fifty-two years of age, responded well to testosterone treatment, a fact which indicates the correlation of mastosis with glandular disturbances. The author, in discussing the etiopathogenesis, emphasizes the dysplastic nature of the condition on an endocrine basis; it particularly involves the ovaries and the thyroid glands. In males the alteration of testicular function is the cause.

The pathological anatomy is discussed in great detail and illustrated with numerous photomicrographs (Fig. 1). According to Kueckens the initial and principal change is hyperplasia and thickening of the periacinal and peritubular fibrous stroma. Lazzarini states that the epithelium is compressed by this reaction in the stroma. The author believes that the epithelial changes occur first.

When mastosis is not subjected to treatment the course of the disease varies; periods of rest being interspersed with periods of progressive change and of regression. In general the changes are slowly progressive. In the differential diagnosis pyogenic mastitis, tuberculosis and syphilis as well as dermoid cysts, hydatid cysts, steatonecrosis and carcinoma should be considered.

Before the modern treatment of mastosis there were recurrences in 10 per cent of the cases and in 11 per cent secondary cancer developed. Since the therapeutic use of folliculin there has been only 1 recurrence in the author's series and this rapidly disappeared on resumption of the treatment.

Until comparatively recently there was no medical treatment for mastosis. The condition was treated pessimistically with surgery. Offergeld in 1932 and Leriche in 1933 were the first to use folliculin with favorable results. Lazzarini has favored small doses, not more than 500 units per day. Lewis and Geschickter have recommended the administration of 10,000 units every four days for five months. They also give prehypophysis hormone with the folliculin. The author has used continuous daily oral doses of 500, 1,000 and 2,000 units and if after one month of such treatment there is no response he injects 1,000 units per day for a week. The author does not encourage the continued use of a large dose of folliculin for fear of inhibiting ovarian function. For large cysts which do not respond to hormone therapy, he advises surgical ablation.

In conclusion Caminiti notes that mastosis is a dysplastic degenerative condition of the breast correlated with ovarian and ovariothyroid disturbances of function. The treatment of choice is hormone treatment with folliculin alone or associated with antithyroidin. Surgery is limited to isolated cases with large cysts that do not respond to hormone treatment.

An extensive bibliography adds to the value of this monograph. JACOB E. KLEIN, M.D.

Rodman J S and Ingleby H Plasma Cell Mastitis *Ann Surg*, 1939 109 921

The authors believe that chronic cystic mastitis is a phase of aberrant breast physiology and that traumatic fat necrosis infected galactocoele, lactation mastitis and plasma cell mastitis are related physiological disorders

Clinically plasma cell mastitis is frequently indistinguishable from carcinoma. A hard lump, pigskin nung, retracted nipple, and firm axillary nodes are present. The mass in contradistinction, is usually tender and there is the history of a preceding inflammation

The discussion is based on the case of a forty two year old white female, formerly perfectly healthy who had noted soreness in both breasts two years before her admission to the hospital. This soreness disappeared only to recur in the left breast one month prior to admission. The left breast contained a hard mass fixed to the skin, and the axillary nodes were enlarged. At operation, though frozen section showed only chronic inflammation, the breast tissue was grossly suggestive of cancer and a radical mastectomy was performed. The patient had a stormy postoperative course, due to toxemia and shock, which suggested the absorption of products of protein digestion

Thorough gross and microscopic study of the specimen revealed a widespread inflammatory reaction similar to that originally described by Ewing. Inflammatory granulation tissue, plasma cells, foreign body giant cells, eosinophils and proliferation of the duct epithelium were noted. Large numbers of colostrum like cells and fatty acid crystals were also seen, but the presence of cholesterol could not be demonstrated even by chemical test

The authors suggest that the etiological factor in plasma cell mastitis and related conditions in non pregnant women such as fat necrosis, infected galactocoele and probably chronic lactation mastitis, may be the enzyme split products of milk disintegration. The microscopic picture in all these conditions has many common features. Experimental corroboration is also offered. Pancreatized milk injected into rabbit breasts produced histopathology comparable to plasma cell mastitis. The article is accompanied by interesting photomicrographs

JOHN L POOL M D

Horsley, J S Jr Benign and Malignant Lesions of the Male Breast *Ann Surg*, 1939 109 912

Anatomically the male breast is more than a rudimentary organ. It consists of a complicated system of ramifying ducts and glands which persist throughout life. The main ducts are patent and have openings through the skin at the nipple. True hypertrophy of the male breast, or gynecomastia, is similar to virginal hypertrophy in the female, while mastitis, in which the author considers infection to be the main etiological factor may occur not only in adolescence but at any time in adult life. Disease of the breast, however occurs less frequently in the

male than in the female because of the arrest of development at adolescence and the lack of function

A statistical review of the breast lesions in 41 males is made. Nine hundred and forty four lesions of the female breast were seen during the same period of time, or a ratio of 1 male to 23 females. The diagnoses were divided as follows: supernumerary nipple and breast, 5; simple hypertrophy, 2; chronic cystic mastitis, 23; benign tumors, 7; malignant tumors, 4. Thus the non neoplastic lesions, comprising 73 per cent of the series, were the most frequent, while the benign tumors comprised 17 per cent and the malignant ones only 10 per cent of the whole series. In the females, on the other hand malignant lesions occurred in 38 per cent, while non neoplastic lesions were found in 39 per cent

Thirty of the 41 male patients were treated surgically without operative mortality. This group included 26 patients with benign lesions and 10 patients who were treated expectantly all of whom have remained well. Brief case reports on the 4 patients with malignant tumors reveal 1 to be well seven years and three months after radical mastectomy for scirrhous adenocarcinoma without axillary metastasis, 1 is still well sixteen years after simple mastectomy for papillary cystadenocarcinoma, 1 is in good health four years after biopsy and irradiation for squamous carcinoma in an accessory nipple, and 1 has succumbed as a result of generalized metastases from an embryonal carcinoma of the testis one metastasis having occurred in the right breast

The prognosis for cure of malignant tumors in the male breast is better than that for malignant tumors in the female breast because the organ is smaller and consequently the condition is more readily recognized

JOHN L POOL M D

Pototschnig G and Peronato G End Results of Treatment for Cancer of the Breast (Risultati lontani dei nostri interventi per cancro della mammella) *Clin chir* 1939 15 361

Pototschnig with the assistance of Peronato collected data on 93 cases of malignant tumors of the breast of which 90 were carcinomas and 3 sarcomas. With the classification of Stenhal as a useful although imperfect criterion the following grouping was determined: 8 cases belonged to Type 1, 52 cases to Type 2 and 33 cases to Type 3. In all but 4 cases the operation performed was the so called radical mastectomy, with excision of the pectoral muscles and accurate dissection of the subclavian vein, the axilla, and the infraclavicular fossa. Interest has been focused particularly upon the problem of local and regional recurrence and the advisability of generous removal of the skin adjacent to the tumor. Bearing in mind the dicta suggested by Schloffer, the authors sacrificed skin so liberally that in only 23.6 per cent of the cases was it possible to close the operative wound and in 47.33 per cent it was necessary to perform a rather extensive plastic operation. In 25 per cent of the

cases the wounds were closed with the aid of Thiersch grafts. In 9 cases recourse was taken to a combined type of plastic operation (Heidenham Payr or Heidenham Thiersch) although the advisability of performing so drastic a procedure after an already exhaustive operation seemed highly questionable.

In the tabulation of the results the authors distinguish carefully between those cases of death from remote metastases in which they think that operations on the primary and regional lesions were not to be considered as determinants and local recurrences which depended for the most part upon the extent and the technique of surgery. Of 53 patients operated upon and dismissed as cured after five years 11.3 per cent died subsequently of intercurrent disease (1 case of Type 1, 5 cases of Type 2), 35.8 per cent died of remote metastases (11 cases of Type 2, 8 cases of Type 3), 5.6 per cent died of cutaneous metastases (1 case of Type 2, 2 cases of Type 3), 5.6 per cent died with metastases in the supraclavicular glands (2 cases of Type 2, 1 case of Type 3), and 20.6 per cent with local recurrences or involvement of the regional glands. Of 12 patients then who were operated upon and dismissed as cured after three years 16.6 per cent died of remote metastases, 33.3 per cent of cutaneous metastases, and 16.6 per cent of local recurrences or involvement of the regional glands. Therefore of 65 patients who were operated upon from three to thirteen years previously, 50 died at varying intervals and 50 per cent of the mortality was due to remote metastases. Local recurrences accounted for death in 20 per cent, a figure not far removed from that obtained by Schloffer but notably lower than that given by most statistics. The authors attribute their results in this respect to a liberal removal of skin.

The authors add the accounts of 4 patients previously subjected to inadequate operations and operated upon secondarily at a later date to emphasize the singularly inauspicious prognosis accorded by experience to such situations.

In conclusion the authors advocate the most radical possible treatment of malignant tumors of the breast. The operation should include the removal of a generous amount of overlying and surrounding skin.

EDITH FARNSWORTH M.D.

### TRACHEA LUNGS AND PLEURA

Cokkalis P. Congenital Bronchiogenic Cysts of the Lung (Ueber die angeborenen bronchiogenen Lungencysten). *Deutsche Ztschr f. Chir.* 1938 251 400.

The author describes 3 personally observed cases of congenital bronchiogenic cysts of the lung. The clinical symptoms of this condition are inconstant and uncharacteristic such as respiratory difficulties, mild pains in one side of the chest and insidiously developing pleuritis. All clinical phenomena may moreover be absent for which reason the condition

often goes unrecognized. The chief diseases to receive consideration in the differential diagnosis are bullous emphysema, spontaneous pneumothorax, interlobar empyema, and echinococcus cysts. Even with roentgen examination it is frequently impossible to clear up the diagnosis. Roentgen examination in several planes can however render valuable aid. An important sign is the absence of a communication between the bronchus and the cyst.

In childhood the cysts contain air, later they are filled with a reddish brown material of the consistency of thick porridge. An epithelial lining is not always present. The wall consists of a thin fibrous capsule. Occasionally small daughter cysts are found in the vicinity of the main cyst.

Treatment may be the removal of the affected lobe or of the entire lung or opening of the cyst by means of a thoracotomy and removal of a portion of the cyst wall. With the last named method a fistula with a slight secretion which is not very troublesome remains permanently.

In one of the author's 3 patients the affected lung was removed; this patient died on the eighth day after the operation. The 2 other patients were treated in the last named manner and were rendered free of symptoms with the exception of the fistula. A remarkable feature of one case was that on the occasion of a jump from a height of 3 meters rupture of the cyst occurred with entrance of the non-infected contents into a bronchus and the coughing up of large amounts of a chocolate brown fluid. The communication remained open however only a short time.

(VON HASSELBACH) FLORENCE A. CARPENTIER

Jacob P. Delarue J. and Gaultier M. Bronchial Stenosis of Long Duration Due to Benign Bronchial Tumor (Cylindroma). Repermeabilization of the Bronchus Following Intratumoral Radiotherapy (Steno e bronchique de longue durée par tumeur bénigne bronchique [cylindrome]. Repermeabilisation de la bronche après une curiethérapie intra tumorale). *Bull et mem Soc. méd. d. hop. de Par.* 1939 55 525.

Very little has been written in France on the subject of benign bronchial tumors. In Germany the studies of this type of tumor have been chiefly anatomical and histological. The English literature contains more complete clinical, histological and even therapeutical studies. As regards incidence the benign bronchial tumors comprise only about 6 per cent of all bronchial tumors.

The author describes in detail a case in a woman thirty three years of age in whose sputum Koch bacilli had recently been demonstrated. She had lost much weight and complained of frequent cough with dyspnea on effort and transitory pain in the right side. The sputum was occasionally streaked with blood. Her temperature although never very high was not normal.

Examination revealed a dullness over the whole right half of the chest. The vesicular murmur was abolished on this side and replaced by a bronchial

murmur most intense at the peak and in the inter scapulovertebral region

Röntgenological examination showed a uniform diminution of diffuse transparency through the right half of the chest. The trachea was displaced to the right with no kink or malformation. A diagnosis of total atelectasis due to bronchial stenosis was established on the basis of these findings. Diagnosis had been rendered more difficult because of the long history of pulmonary disease. The patient had been hospitalized on numerous occasions. In 1935 for the first time a parabolic opacity was noticed. Pulmonary syphilis was suspected and bismuth was prescribed at that time. In 1936 a lipiodol bronchogram was taken which revealed unmistakable bronchial stenosis. The lipiodol was obstructed on the right side so that between the median lobar bronchus and the trunk of the inferior lobar bronchus there was a large pulmonary area without injection. Finally this inferior lobar bronchus ended in a group of bronchial dilatations.

Radiotherapy was attempted but had to be abandoned because of fever. Arsenic was then prescribed for suspected syphilis, but had likewise to be abandoned because of cutaneous complications. In 1937 the patient was admitted for dyspnea, cough, and a fever of  $39.5^{\circ}\text{C}$ . This time the diagnosis was pleural effusion. Punctures were negative. The patient was sent to a preventorium.

In 1938 a lipiodol test of the permeability of the bronchi was undertaken. It was found that the earlier obstructed bronchus had become permeabilized and that the upper lobe had partially cleared up. Bronchoscopy revealed a red polyp in the right bronchus at the insertion of the apical bronchus which bled at the slightest touch. A biopsy specimen proved that the growth was not cancer. An attempt was therefore made to destroy the tumor with intra-tumoral radium. A long radium needle of 2 mgm was implanted attached to a silk thread which was fastened to the patient's cheek with a bit of adhesive plaster. Bronchoscopy was tolerated after the administration of preliminary sedatives. A few cgm of morphine were given daily to diminish the cough. Nutrition was maintained by nutrient enemas and subcutaneous injections of physiological saline solution. Ten days later the radium needle was easily removed. A total dose of 3.60 mcd had been applied. On several occasions roentgenograms had been taken to ascertain that the needle was in place. The temperature rose abruptly after the first three days and varied from  $40^{\circ}$  to  $38^{\circ}$  until about a week after removal of the needle. Following its removal there ensued an abundant expectoration of purulent and mucopurulent matter containing numerous polynuclear, some gram positive and some gram negative cocci. Gradually the fever abated, the general condition improved and the expectoration diminished. The vesicular murmur could now be heard. The patient gained 4 kgm. The thoracic sonority was diminished. A new bronchogram revealed re-permeabilization of the bronchus. However, in spite

of destruction of the tumor, the parenchyma of the lung had been extensively destroyed with diffuse sclerosis and bronchiectasis. Even though histologically benign, such tumors may therefore have very serious consequences. After a review of the literature, the author concludes by emphasizing the dangers of bronchial stenosis in benign bronchial tumor and the beneficial effect of early endobronchial treatment.

EDITH SCHANCHÉ MOORE

Merlini, A. The Effects of Phrenicotomy Phrenicotomy Exeresis, and Stimulation of the Phrenic Nerve on the Pulmonary Temperature (Gli effetti della frenicotomia della frenicoexeresi e della eccitazione del nervo frenico sulla temperatura polmonare) *Ann Ital di chir* 1939 18 201

In his experiments, Merlini determined the temperature of the pulmonary parenchyma directly by introducing a thermo electrical needle through the fourth or fifth intercostal space and the anterior or middle axillary line into the lung of the dog on the side on which the phrenic nerve was isolated. An injection of morphine was sufficient to keep the animal quiet during the entire period of the experiment. After having observed for a few minutes the galvanometric deviations independent of any maneuver, he applied mechanical or electrical stimulation and performed section and exeresis of the phrenic nerve. In his last experiment he also isolated the vagosympathetic nerve trunk and subjected it to the same maneuvers. The following facts were elicited from a recapitulation of the results which were obtained.

Mechanical stimulation of the phrenic nerve in 2 cases and its electrical stimulation in 1 case were incapable of causing any change in the pulmonary temperature. Mechanical stimulation of the central stump of the nerve in 3 cases gave contradictory results: in 1 case there was no effect, in 1 there was an increase and in the third a decrease in the temperature. Mechanical stimulation of the peripheral stump of the nerve in 3 cases caused a constant increase in the temperature. Electrical stimulation of the central stump in 5 cases gave contradictory results: in 1 there was no effect, in 2 there was an increase and in 2 a decrease in the temperature. Electrical stimulation of the peripheral stump in 6 cases was ineffective in 3, produced a marked increase in the temperature in 2 and a slight increase in 1.

In 6 of 10 cases phrenicotomy caused a more or less marked increase in temperature, in 1 the temperature remained stationary and in 3 the result was nil or not clearly noticeable. Phrenic exeresis in 9 cases was ineffective in 2, succeeded in arresting the fall in temperature in 1, and caused a marked increase in the temperature in 6.

For the correct evaluation of these results it is necessary to take into account the known property of morphine to reduce the temperature of the lung and of the entire organism and the fact that these temperatures in the dog fall because of the effect of immobilization on the operating table, the rectal or

vaginal decrease in temperature due to these causes during the present experiments ranged from 0.3 to 2.8 C. Consequently more importance should be attached to rises than to falls of temperature in order to accept a hypothermic or negative result the fall in pulmonary temperature should be adequate. The response of the lung to the stimulations was not immediate but took one or more minutes because changes in temperature occur only through complex modifications of the circulation and metabolism. The inconstant and contradictory results of mechanical and electrical stimulation of the central stump make it appear probable that there are present in the nerve centripetal fibers which regulate the pulmonary circulation in a reflex manner. The results of stimulation of the peripheral stump and those of phrenicotomy and phrenico-exeresis are connected with active congestion of the lung and confirm the presence in the nerve of vasoconstricting sympathetic fibers which innervate the pulmonary and bronchial vessels. The anatomical structure of the phrenic nerve and the topography of its anastomoses with the cervical sympathetic nerve explain the greater intensity of the effects obtained by phrenico-exeresis than by phrenicotomy and justify the modern surgical tendency to give the preference to the former in the treatment of pulmonary tuberculosis. **RICHARD KEMEL M.D.**

**Caeiro J.** The Technique of Total Extirpation of the First and Second Ribs in One Stage (Técnica para la extirpación total en un tiempo de la primera y segunda costillas) *Bol. Soc. de Ciruj. de Buenos Aires* 1939 23 119

The author omits the discussion of the clinical indications for total extirpation of the first and second ribs and limits himself to the description of the technique of the operation which may be supplemented if necessary by partial resection of the third rib. Such procedures may be considered when an upper thoracoplasty is contemplated in order to

obtain maximum collapse of the pulmonary apex. The author's technique allows the performance of the operation in one stage and offers the possibility of a partial or total resection of the third rib and the employment of local anesthesia. A good exposure is obtained; the collapse of the involved apex is very effective and finally the operative shock is minimal. Scopolamine and morphine are given preoperatively. The position of the patient and the location of the incisions are illustrated in Figure 1. The first incision is made in the supraclavicular region in front of the trapezoid muscle and the second in the sternal region 1 cm. below and parallel to the clavicle. First the posterior section of the first rib is performed which is to be followed by the anterior section. The separated rib is pulled out through the infraclavicular incision and the second rib is removed in the same manner.

The postoperative course is usually smooth and postoperative treatment does not differ from the customary measures employed after thoracoplasty.

**JOSEPH A. NARAT M.D.**

### HEART AND PERICARDIUM

**Bigger I. A.** Suppurative Pericarditis *Ann. Surg.* 1939 109 793

In about half of the cases of acute pericarditis at the Medical College of Virginia Hospitals the condition is diagnosed prior to death. It is the author's contention that physicians should make repeated examinations of the cardiac area in patients with sepsis, especially in those with intrathoracic or subphrenic infections and osteomyelitis with septicemia. X-ray examinations will usually demonstrate findings which are characteristic enough to make the diagnosis. Because of the difficulty of making the diagnosis of intracardiac suppuration, diagnostic aspiration may be done, but if the diagnosis is clear cut it is probably better to proceed with the pericardiotomy without preliminary puncture, as pericarditis is not without danger.

It has been shown that 50 per cent of patients with suppurative pericarditis will recover if subjected to surgery and that those who die generally die of something other than the pericarditis. It is unfortunate that there have been reports in the literature of patients who have recovered following aspiration alone or aspiration with sulfanilamide. It seems unlikely that any appreciable amount of suppuration would be cured by such measures and it appears that many cases of suppuration so treated will go on to the formation of severe adhesions of the pericardium. Exposing the heart to the atmospheric air apparently does not give rise to the symptoms of cardiac tamponade as has been thought. Certainly the improvement following the drainage of a large amount of pus is striking.

The fourth and fifth left costal cartilages are usually resected and at times that portion of the sternum between the third and sixth cartilages is resected away. The pleura is carefully freed up-



Fig. 1 Location of incisions

ward and retracted to the left to expose the pericardium, which is incised for  $1\frac{1}{2}$  or 2 in. The wound edges are sutured to the muscle sheath or fascia to prevent too early closure of the drainage tract. This gives excellent exposure and permits digital separation of fibrinous adhesions that form so rapidly between the pericardium and the epicardium. In order to prevent this latter complication the adhesions are separated by the gloved finger, daily for several days.

One important point which should not be overlooked is the fact that the patients with the most virulent infections die without operation if a policy of delay is pursued. It will naturally tend to improve the results if only those cases operated upon are reported, but, since there is no evident contraindication to early operation as in acute empyema of the pleura, it seems reasonable to suppose that the total number of cures in patients with acute suppurative pericarditis will be greater if the patients are operated upon as soon as the diagnosis is established. It seems quite clear that the recovery period is reduced by early operation and it may be significant that the pericarditis was of fairly long duration in the 2 patients who developed obstruction of the inferior vena cava. JOHN WILTSE EPTON, M.D.

#### MISCELLANEOUS

Miller E. M., Parmelee, A. H., and Sanford H. N.  
Diaphragmatic Hernia in Infants. Report of  
2 Cases. *Arch. Surg.* 1939 38 979

Congenital hernia of the diaphragm may be encountered at any stage of life and may attain a

considerable size without becoming incompatible with fairly good health. It is seen frequently in the newborn. Few infants, however, live long if obstructive symptoms develop, and most of them die within a few hours, or at most a few days after birth. Successful operative results in infants less than one year of age are few. The high mortality is due to the difficulty in making an early diagnosis, the trouble encountered in preparation of the baby for operation, and the technical difficulties incident to the operative procedure itself.

In the author's first case the diagnosis was easy and the problem of pre-operative preparation comparatively simple, the surgical procedure involved in the reduction of the abnormal contents of the thoracic cavity and the repair of the defect in the diaphragm were not difficult and the outcome was successful. In the second case the diagnosis was impossible without roentgen examination and the preparation of the baby for the operation extremely difficult. The final outcome, after three major operations, was fatal.

These 2 cases are reported in minute detail and an autopsy report on the fatal case is included. The importance of making a snug closing of the neck of the hernial sac with non-absorbable suture material is emphasized. Failure to accomplish this at the first operation was responsible, the authors believe, for the trouble which followed later. Further, the method of anchoring the stomach in its normal position was found to be very effective. If this also had been carried out at the first operation the result might have been a success.

J. DANIEL WILLEMS, M.D.

# CARCINOMA OF THE GALL BLADDER

## Collective Review

JOHN H. MOHARDT, M.D., F.A.C.S., Chicago, Illinois

*Historical.* Carcinoma of the gall bladder which was considered a rare disease in 1850 is now recognized as a common one. The apparent increase in frequency of this disease parallels the increase in the number of operations on the gall bladder.

The approach to the study of carcinoma of the gall bladder has varied in accordance with the interest of the period. During the early years from 1840 to 1870 observations were accumulated and the clinical signs of the disease were compared. Then from 1870 to 1880 there appeared a series of reports on the surgical treatment of malignant tumors of the gall bladder. In the third period it was especially the etiology and pathogenesis which were studied. During this period the relations between biliary lithiasis, infection and cancer were particularly stressed. At the present time attempts are being made to reproduce the disease experimentally in the hope of evolving new theories concerned with the pathogenesis of malignant tumors. Also procedures by means of which an early diagnosis may be made have increased in number and are being perfected.

Stall of Vienna in 1777 published the first authentic record of 2 cases in which autopsy was performed. One of these was spectacular, the patient having transposition of the viscera with carcinoma in a gall bladder situated on the left side. Halle reported a case in 1786 and Bailie in 1794. Nine cases were recorded from 1800 to 1850. The first complete study was that of Durand Fardel which appeared in 1838. Frerichs described the disease in 1858. From 1850 to 1860 but 9 cases were recorded. The decade from 1860 to 1870 presented 15 additional cases. In 1870 Villard collected reports of 26 cases and contributed the most complete study which had been made up to that time. Musser in 1889 analyzed 100 cases. Courvoisier in 1890 summarized 103 cases. Ames published his work in 1894 and W. J. Mayo in 1902 reported the incidence of carcinoma of the gall bladder in 405 operations on the gall bladder and biliary ducts for all causes. It is estimated that more than 2,000 cases are on record in the literature. The nineteenth century writers there-

fore acquainted us thoroughly with the pathological and clinical picture. It remained for authors of the present century to indicate its frequency. Notable contributors to the subject since 1900 are Sherrill, Robson, Moynihan, Cotte, Mayo, Quenu, Rolleston, Judd, Deaver, Lentze, Fawcett and Rippmann and Illingworth.

*General Incidence.* The disease is found infrequently in the lower animals; however, a few cases have been reported. Savage described an adenocarcinoma of the gall bladder in a hen. Feldman reported a case of adenocarcinoma of the gall bladder in a cow. Reviewed the available literature concerning cancer of the gall bladder in the lower animals and concluded that such tumors are rare and seldom occur. He attributed the rarity of the condition in animals to the negligible incidence of gall stones (23 in 5,725 necropsied cattle or 0.4 per cent) and early deaths.

The exact incidence of primary carcinoma of the gall bladder is difficult to determine. Shelley and Ross give the condition fifth place in frequency of incidence of cancer among the organs of digestion while Boyce and McFetridge give it sixth place. The order of incidence is as follows: (1) stomach, (2) colon and cecum, (3) rectum, (4) esophagus, (5) gall bladder and ducts. Kaufman estimated that carcinoma of the gall bladder constitutes about 5 per cent of all cancers examined at autopsy. In Jankelson's series of 11,400 consecutive autopsies it was found 31 times an incidence of 0.27 per cent. In a combined total of 13,034 autopsies reported by Illingworth and Potter from Edinburgh and Ann Arbor there were 46 cases, an incidence of  $\frac{1}{2}$  of 1 per cent. Schroeder estimated that from 5 to 12 per cent of all autopsies done as a routine measure reveal gall stones. The frequency of cancer of the gall bladder as compared with cancer of other organs is shown in Table I compiled by von Berencsy and von Wolff.

An analysis of the table shows clearly that cancer of the gall bladder has a marked tendency to occur more frequently in women than in men and that it constitutes in most statistics between 8 and 10 per cent of all cancer in women. Von Berencsy and von Wolff found cancer of the gall bladder in approximately 0.85 per cent of all autopsies.



TABLE I—THE FREQUENCY OF CARCINOMA OF THE GALL BLADDER IN RELATION TO OTHER VISCERAL CANCERS

Authors	Buday		Bejath		Redlich		Ferkhenfeld		Ruechelman		on Berensky and von Wolf	
No of autopsies	530		688		5002		5022				19908	
No of cases of cancer	336		692		406		507				2314	
Organ	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
	Per cent		Per cent		Per cent		Per cent		Per cent		Per cent	
Esophagus	6.21		20.1	0.8	17.3	1.8	11.3	1.6	20.0	1.4	11.83	0.61
Stomach	38.42	19.36	36.5	31.3	39.9	39.6	39.9	25.2	46.6	34.1	48.90	20.45
Intestine	5.64	1.05	8.2	6.1	4.2	6.1	4.3	4.5	3.7	3.0	5.34	2.75
Gall bladder	1.12	2.10	1.9	8.5	3.5	10.8	1.2	9.1	3.9	9.5	1.77	10.18
Bl east	0.56	3.50	12.5	0.55	12.2		12.6		0.3	3.3	0.99	6.8
Ovary		14.78		2.2		5.2		4.7		4.0		8.10
Vagina												
Uterus		45.40		13.3		13.1		17.7		14.6		55.90
Uterus		44.33										34.85
Vagina		1.0										1.74

See. Practically all the reported series show a much higher incidence of carcinoma of the gall bladder in females than in men (Table II).

Ewing states that carcinoma of the gall bladder is from 4 to 5 times as frequent in females as in males while Kaufman, Harley, Kraus, and Col well believe it to be 2 times as frequent. Judd and Baumgartner consider it to be 3 times as frequent in females as in males. In practically all the series from 80 to 90 per cent of the patients were women, the ratio being roughly 4 to 1. The greater incidence in females is considered by most authors to result from the preponderance of gall stones in females. The figures which are given correspond closely to the various estimates which have been made as to the relative frequency of gall stones in the two sexes.

Age. Ewing states that cancer of the gall bladder occurs nearly always after the age of forty, and gives fifty eight years as the average age of occurrence in both sexes. Shelley and Ross found the average age to be sixty years, the youngest

patient in their series being forty-eight, and the oldest seventy. Proescher recorded a case in a male twenty two years of age. Kaufman, Haas, Chavannaz, and Miller each reported a case in a patient twenty five years of age. Thomas and Noica reported a case in a patient ninety years of age. Kaufman mentioned a woman ninety five, and Haberfeld recorded a case in a woman ninety three years of age. In the 212 cases recorded by Judd and Gray, the condition occurred most frequently between the ages of fifty and seventy years. The average age was fifty seven and one tenth years. (See Table III.)

In view of Table IV, the causative role of cholelithiasis is accepted as certain. The relationship of stones to malignant disease of the gall bladder is interesting and important, the great majority of cases show the presence of stones prior to the development of the neoplasm. The percentage of cases in which stones occur varies from 65 to 100 per cent, most authors indicating that it varies between 70 and 90 per cent. (See Table V.)

TABLE II—CARCINOMA OF THE GALL BLADDER IN FEMALES

Author	Percentage
Zenker	72.9
Fueterer	77
Naunyn	83
Musser	75
Seide and Geller	69
Shelley and Ross	68.9
Boyce and McFetridge	56
Judd and Gray	74
Lidmann	100

TABLE III—CARCINOMA OF THE GALL BLADDER ACCORDING TO AGE

Age	Percentage
Under 30 years	6.9
30-40 years	4.7
40-50 years	14.9
50-60 years	49.3
60-70 years	33.33
70-80 years	6.0

The youngest patient was twenty three years of age and the oldest was seventy eight years of age.

TABLE IV — THE INCIDENCE OF CALCULOSIS IN CANCEROUS GALL BLADDER

Author	Per cent
Judd and Gray	64.6
Musser	69
Fuetterer and Haberfeld	70
Shelley and Ross	73.7
Boyd	80
Papin	80 to 90
Frerich	82
Dela Vale	82
Eurico Bastos	84.6
Tendemann	85
Courvoisier	88
Deaver	88
Zenker	90
Blument	90
Fabrus	90
Savv	90
Friedmann	92.5
Ducuney	94
Judd and Baumgartner	94
Siebert	95
Moynihan	95
Keene	95
Riedel	95
Janowski	100

Erdmann does not favor the recommendation of cholecystectomy for the calculous gall bladder when the recommendation is based only upon the assumption that the condition is a precancerous state. He argues that the operative mortality for cholelithiasis is 2.85 per cent in 525 cases is greater than the incidence of carcinoma of the gall bladder 1.14 per cent in 525 cases. However the majority of statistics show that the incidence of cancer in patients having gall stones is much greater than that cited by Erdmann. One may conclude from the figures cited that the incidence of cancer in patients having stones is from 4 to 5 per cent. It is obvious therefore that cholecystectomy should be recommended not only for colic infections, gangrene and perforations but also because of the possibility of future cancer.

**Incidence in Relation to Surgery** The incidence of malignancy of the gall bladder is commonly given as ranging from 0.5 to 5 per cent. W. J. Mayo in a report presented in 1902 and based upon 405 operations performed upon the gall bladder and biliary ducts found that 5 per cent of the operations were done for malignant disease. Magoun and Renshaw from the same clinic reported cancer in 1.06 per cent of 7,878 gall bladder operations. MacCarty in 1919 published a survey of 5,000 gall bladders removed at operation at the Mayo Clinic and in that group there were 24 or 0.5 per cent with cancer. Judd and Baumgartner in 1929 found 89 gall bladders to be malignant among 14,978 cases in which cholecystec-

TABLE V — THE INCIDENCE OF CANCER IN CASES OF STONES

Author	Percentage
Erdmann	1.14
Eurico Bastos	2.29
Kehr	3.00
Heller	3.34
Gesner	4
Leitch	4.3 to 5.1
Rolleston	4.5
Graham	4.5
Moynihan	5.0
Mayo—1902	5.7
Quimo	6.13
Riedel	7.8
Fawcett and Rippmann	8.1
Mayo-Robson	10
E. Gioja	12.5
Sherill	14
Schroeder	15

tomy was performed. Judd and Gray, in 1932 reported upon 22,365 operations on the gall bladder and biliary passages performed from 1907 to 1930 inclusive. They found 12 cases of primary cancer of the gall bladder and 100 cases of carcinoma of the biliary passages. At the Mayo Clinic the relative frequency has diminished from 5 per cent in 1902 to about 0.5 per cent in more recent years.

The difference in incidence is ascribed to the fact that diseased gall bladders are now removed earlier than in previous years. In a grand total of approximately 35,054 operations on the gall bladder reported in individual series by Wilkie, Deaver, Smith, Judd and Gray, French, Sherill and MacCarty, there were 393 cancers of the gall bladder, an incidence of 1.12 per cent. A combination of statistics gives a clearer picture of the incidence of the disease than any individual study.

The surgical incidence is more variable and greater than the autopsy incidence. This result is to be expected as a consequence of the thorough search at autopsy. It should be remembered that the incidence based upon operative cases gives a distorted view as these are selected cases.

**Experimental studies on gall stones and cancer** Most authors regard gall stones as causative agents of gall bladder cancer. The basis for this view is:

1. The frequency with which calculi are found in cases of primary carcinoma of the gall bladder.
2. Reports of the experimental production of cancer by the insertion of foreign bodies into the gall bladders of animals.

Kazama inserted foreign bodies into 98 guinea pigs and reported the occurrence of cancer in 26 animals, 9 of these developed metastases.

Leitch repeated Kazama's experiments and inserted gall stones into the gall bladders of 25

guinea pigs, pebbles in the gall bladders of 5, and pills of pitch in the gall bladders of another 5, and reported the occurrence of cancer in 8 within one year. Of the 8 cases, 5 were caused by gall stones, 2 by pebbles, and 1 by a pellet of pitch. Fifteen of the animals were alive one year following the operation, but their ultimate fate has not been recorded.

Burrows reviewed the subject of the experimental production of cancer of the gall bladder. After careful study, he concluded that cancer had not been produced and that numerous attempts had failed to produce any evidence of carcinogenic properties in gall stones. Foreign bodies produce a marked inflammatory proliferative hyperplasia in the mucosa that simulates cancer, but does not cross the indefinite boundary between inflammation and neoplasia. Several writers have suggested that stones predispose to cancer of the gall bladder by virtue of some special constituent. Lazarus Barlow has shown that some gall stones contain radio active salts and suggested this element as an etiological factor. However, his work could not be duplicated. It is known that gall stones contain traces of several minerals such as copper, iron, manganese, cholesterol, calcium, and bile pigments. The properties of these elements are known and none could reasonably be invoked as a causative factor in the formation of cancer.

**Etiology** The specific etiological factor in carcinoma of the gall bladder as in carcinoma elsewhere, is not known. The theory of embryonic rests has been proposed frequently to explain can-

cer of the gall bladder, especially squamous cell cancer of the gall bladder. Heredity has been considered to be the all important factor. Multiple papillomas of the gall bladder have been considered to be precancerous. The evidence concurred with the incidence of cholelithiasis has established chronic irritation as a contributing factor at last.

It is Ewing's opinion that the factors involved in the production of cancer of the mucous membrane of the gall bladder are not individual, but a combination of components, i.e., (1) mechanical irritation of calculi, (2) inflammation that excites cellular hyperplasia, (3) relation to cholesterol metabolism, and (4) irritative and digestive action of bile.

**Relation to Infection** A pathological change more common than stones is infection. In cases of carcinoma in the early stages, in which only a small portion of mucosa is invaded by the tumor, there are always present varying degrees of subacute and chronic infection, with fibrous thickening of a free portion of the organ, which indicates a chronic inflammatory process. In numerous microscopic studies of inflamed gall bladders, with or without stones, evidence of active proliferation and regenerative hyperplasia of the mucosal epithelium is present. Some particles of the active epithelium detach themselves from the surface, become embedded in the deeper layers of the wall, and penetrate at times as far as the serosa. These detachments usually have the appearance of duct-like structures or sinuses (the Rokitsansky Aschoff sinuses and Luschka's crypts), and in some the

TABLE VI—A RÉSUMÉ OF THE EXPERIMENTAL WORK

Authors	Animal	Foreign body	Duration of life after operation	Cancer free	With cancer	Metastases	Survivals
1922 Kazama	guinea pig 98	gall stones sutures mucous membrane pitch	5½ months	72	26	9	ultimate results not recorded
1924 Leitch	guinea pig 35	gall stones pebbles pitch pills	12 months	27	8	0	15
1927 Clemente	guinea pig 20	cement pills tar pills	3½ months	20	0	0	0
1928 Delbet and Godard	guinea pig 16	gall stones	19 months	14	2	0	0
1928 Petrov and Krotkina	guinea pig 30	gall stones paraffin coal tar	20 months	30	0	0	0
1929 Gjojs	guinea pig 17	pebbles pumice tar	23 months	7	7	0	0
1932 Geokin and Dmstruk	rabbit 19	gall stones bile (frog) pumice	48 months	19	0	0	0
1933 Burrows	guinea pig 11	gall stones	16½ months	33	0	0	0

epithelium is several layers thick. Among these cells mitotic figures are often found which indicates rapid growth. It is likely that such epithelial strands in the depth of the gall bladder wall are the precursors of neoplasms which behave like detached epithelial transplants and may acquire the characteristics of independent autonomic growth. While irritation resulting from chronic inflammation offers only indirect proof of its relation to tumor formation the frequency with which it occurs compels its consideration as an important contributing factor.

*Relation to Papillomas* In 1910 MacCarty emphasized the frequency of benign papillomas of the gall bladder and described the condition as catarrhal papillomatous cholecystitis. He considered it a type of strawberry gall bladder since many of the papillomas contained deposits of cholesterol. Simple papillomas are of common occurrence in the gall bladder. According to Judd and Baumgartner about 10 per cent of the gall bladders removed at operation have one or more papillomas. They occur as minute polypoid excrescences on the mucous membrane surface. Microscopically they have the characteristics of papillary columnar celled adenomas and are generally benign. That these benign structures predispose to cancer of the gall bladder is highly improbable as may be judged by the fact that Phillips has reported recently a series of 500 papillomatous gall bladders without a single instance of malignant degeneration. However malignant degeneration in gall bladder papillomas has definitely been reported by Ringel, Pels, Lensden, Hruska and others.

The papillomas described by MacCarty occur relatively early in the course of disease of the gall bladder. All such cases show an accompanying infection in the mucosa. Stones were present in 26.8 per cent of the papillomatous gall bladders. It is presumed that in many more cases stones would have formed eventually because of the presence of the deposits of cholesterol. The presence of papillomas is ample evidence of the epithelial proliferative power of the mucosa and one cannot deny that papillomas have the capacity to form cancers although the transformation occurs but rarely.

*Relation to adenomas* Adenomas are variously classified as adenomas, adenomyomas, fibroadenomas, cystadenomas, papillary adenomas and mixed forms. The adenomas are composed of glandular structures lying within the wall of the gall bladder. Wellbrock reported 69 adenomas in 9,550 gall bladders surgically removed. All but 4 were in the fundus. Two were malignant. Forty

seven occurred in females and 22 in males. Thirty-eight were associated with stones and 31 were without stones. One of the malignant tumors occurred with stones and 1 without. Adenomas were found in papillomatous gall bladders.

Wellbrock states that there are three ways in which an adenocarcinoma may originate:

1. It may start in the epithelium of the mucosa of the gall bladder.

2. A small group of adult or fetal heterotopic glands may become malignant and produce adenocarcinoma.

3. There may be malignant degeneration. The change to malignancy is similar to that in adenomas and sessile polyps of the colon.

*Pathology* Cancer of the gall bladder is usually divided into two groups: adenocarcinoma and squamous cell carcinoma. Adenocarcinoma may be subdivided into (a) papillary adenocarcinoma, (b) infiltrating adenocarcinoma and (c) mucous adenocarcinoma. The degree and character of the irritation apparently influence the histological structure of the neoplasm but its character is dependent chiefly upon the specific tissues in the gall bladder which are involved. If the connective tissue in the submucosa is more responsive to the irritation than the mucosa, the subsequent papilloma may be composed mainly of connective tissue elements covered with normal epithelium. If the mucosa is primarily involved the response may be characterized by a proliferation of epithelium and simple benign papillomas may develop. With cell growths unrestrained and differentiation restricted papillary neoplasia may result.

Papillary adenocarcinoma is composed of multiple irregular warty papillary projections varying in size, friable and hemorrhagic and which on histological examination present stalks of connective tissue covered with atypical cylindrical cells and infiltrated by atypical acini lined with cuboidal cells. Ewing describes the tumor as a coarse villous solid fungating mass which usually has its origin in the fundus or neck and grows out into the gall bladder eventually distends and obliterates the organ and forms a bulky massive tumor. It tends to spread along the ducts to obstruct or constrict the cystic duct and bile ducts and produce empyema of the gall bladder and jaundice. In general this type of tumor is slow growing, less malignant than many tumors and with no tendency to infiltrate. Metastases are late and infection is marked. Occasionally this type of tumor appears as a solitary pedunculated growth.

If anaplasia is marked infiltrating adenocarcinoma consists of infiltrating atypical alveoli which rapidly invade all layers of the gall bladder.

the liver, and adjacent structures. Metastases occur early and it is in this group of tumors especially that metastases occasionally give rise to the first signs of the disease.

Scirrhous adenocarcinoma begins as a submucous growth. In the early stage of its development it is recognized as a localized thickening or infiltration in the wall of the gall bladder. The gall bladder wall becomes thickened and contracted the whole organ being converted into a hard, almost cartilaginous mass. It is characterized histologically by an extensive growth of new cellular connective tissue. The picture is that of extensive fibrosis, infiltrated by strands of atypical epithelial cells which tend to form atypical alveoli. The extensive fibrosis may be considered as evidence of considerable immunity to the stimulus to atypical growths which never quite succeeds in strangulating the cancer cells. The fibrous tissue contracts as fibrous tissue does everywhere, which often results in obliteration of the gall bladder. It may produce an hour glass deformity of the organ, and at times only a remnant of the gall bladder containing a central calculus is left. Early extensions to the liver and lymph nodes occur. Fusion to the adjacent viscera is a common finding.

In the gelatinum and colloid types mucous degeneration may occur. It is a regressive change due to overgrowth of the mucous constituents of the gall bladder. Should mucous degeneration be a primary feature of the tumor, extensive secretion of mucus and the formation of a bulky gelatinous mass may result. This type of tumor is quite friable, and ulceration with perforation and extension into the surrounding viscera is a common occurrence. It metastasizes early to the liver, regional lymph nodes, and peritoneal cavity. According to Kaufman, it ranks next to cancer of the stomach as the most frequent source of gelatinous carcinoma of the peritoneum.

The finding of a squamous cell cancer in a mucosa normally covered with cylindrical epithelium has intrigued many investigators, and various hypotheses have been proposed to explain it. Squamous cell cancers have been described in the mucosa of the nasal cavities, the larynx, trachea, bronchi, pharynx, stomach, gall bladder, colon, pelvis, ureters, urinary bladder, urethra, uterus, as well as the thyroid, breasts, pancreas, prostate, and kidneys.

Neither during the development from the primitive gut nor in the adult form is there a vestige of squamous epithelium in the gall bladder. The first bud of the gall bladder is derived from the caudal part of a longitudinal furrow of the ento-

derm situated on the ventral surface of the intestine, the cranial part of which gives rise to the liver.

The theories proposed to explain the transition are the following:

- 1 The theory of embryological arrests. In view of the fact that the gall bladder is at no period of its life related to a squamous membrane gives this view no basis in fact.

- 2 The theory of metaplasia, which may be defined as a transition of one kind of tissue into another of a related kind.

- 3 The theory of the germinal layer, which holds that different types of tissues may be derived from a common parent cell.

Krompecher explains the process of metaplasia by directing attention to a basal cell layer found normally in mucosa lined with cylindrical epithelium. He considers the basal cell layer analogous to the basal cell layer of the skin and affirms that these pleuripotential cells give rise normally to glandular and cylindrical epithelium. Under pathological conditions, it is presumed that the basal cells are capable of forming either flat or cylindrical epithelium. Cell metaplasia according to Krompecher, is, therefore, not a result of postembryonic change in the histological appearance of the cells, but is due to a differentiation of the basal cells either into squamous or cylindrical epithelium.

Roessiger found in 21 inflamed gall bladders associated with cholelithiasis the basal cell layer described by Krompecher. Rabinovitch and Kieffer found in pathological specimens of gall bladders a basal cell layer of cells in the mucosa. These cells are probably concerned in all proliferation and regeneration. The different configurations noted in mixed squamous and cylindrical tumors conceived in this light are not considered as distinct tumor entities but different morphological phases of neoplasms of one and the same tumor type. We are dealing with a tumor arising from a common type of cell which under the influence of the irritant has acquired two distinct histological characteristics. It is not known whether the cylindrical epithelium is transformed directly into squamous epithelium and is then converted into carcinoma, or whether the process is a direct transformation of the basal cells into various forms.

From Mulot's report in 1882 to Roessiger's report in 1930 only 30 cases of pure squamous cell cancers and 8 cases of mixed tumors (association of squamous cells with cylindrical epithelium) are recorded. Roussy and Oberling in 1931 collected 50 cases.

Vomiting is a common feature of the disease. It usually appears in mild form related to pain. It may be persistent and is an outstanding symptom should duodenal obstruction occur.

Jaundice is listed as an outstanding symptom by Judd and Gray who include also bile duct cancers in their report. The icteric index may vary from 20 to 240 the average being about 100. After onset the jaundice is usually continuous, but it may be intermittent and fluctuant. It is usually caused by hepatic metastases or obstruction of the common or hepatic ducts.

Rigidity is not observed unless peritoneal involvement occurs. That is usually terminal.

Tenderness may frequently be detected over the right upper quadrant particularly when a mass is palpable. When the tenderness is marked it is associated with varying degrees of rigidity.

A palpable mass is present in about 50 per cent of the cases. It was firm, tender and of about the size of a lemon, but a large mass may be encountered at times.

The edge of the liver is palpable in about 50 per cent of the cases reported. It may descend from 2 to 10 cm. below the costal margin and can easily be felt in the majority of cases with jaundice. Nodularities on the liver edge are a common finding in advanced cases.

Fever is of common occurrence sometime during the course of the disease. The average leukocyte count is from 12,000 to 16,000 and is always related closely to the extent of the associated infection.

Anemia is not marked as it usually is in cancer of the right side of the colon or cancer of the stomach. The average hemoglobin seldom drops below 60 per cent.

**Diagnosis.** The clinical pictures and symptoms described indicate the difficulties encountered in making a definite diagnosis except in some advanced cases. If there is such a thing as a typical case the clinical picture would seem to be epigastric distress progressing into pain associated with a dyspepsia marked by fullness, bloating, heaviness, regurgitation and belching and with the superimposed symptoms of weight loss, anorexia, gastro-intestinal symptoms and cachexia.

The vague and insidious onset is an important feature and the fact that jaundice is associated with pain does not eliminate malignancy. The gradual onset of jaundice in malignancy distinguishes it from jaundice associated with stones in which the onset of jaundice is sudden. The tumor mass in the region of the gall bladder which is listed as a diagnostic sign by W. J. Mayo should be regarded as a late one. The patient who is not

subjected to surgery until the tumor is palpable is usually beyond surgical aid.

The laboratory is practically of no assistance. If jaundice is present the icteric index will be raised but it gives no specific information as to the presence of cancer. If the liver is markedly damaged liver function tests will demonstrate the fact but the best of them are unreliable and give no clue to the site of the disease.

Kirklin of the Mayo Clinic has been able to detect papillomas with the x rays but this procedure fails to differentiate papillomas from malignant tumors. Roentgenograms are seldom of assistance in differentiating inflammatory from neoplastic disease.

Rolleston states that a correct diagnosis was not made in any of the 48 cases reported from Guy's Hospital. Boyce and McFetridge report 2 cases diagnosed pre-operatively in their series of 25 and 4 cases in which the condition was suspected. The failure to make a definite diagnosis is typical of practically all the reported series.

**Differential Diagnosis.** The diseases commonly to be differentiated are:

Malignant disease of the liver. Primary cancer of the liver or cancer metastases whether from the gall bladder or other sources presents the same picture. A preceding history referable to the gall bladder suggests that organ as the origin of growth.

Carcinoma of the stomach. Cancer of the gall bladder may cause pyloric obstruction by pressure. A barium sulfate meal and a roentgenogram may differentiate the causes of the obstruction. The two conditions should differ in their early history.

Cancer of the hepatic flexure. Invasion of the colon by cancer of the gall bladder may present symptoms identical to those of cancer of the colon. A gastro-intestinal study with the x rays usually differentiates the conditions.

Cancer of the head of the pancreas and bile ducts. Late in this disease the similarity between this condition and cancer of the gall bladder is striking.

Syphilis of the liver. Syphilitic disease of the liver particularly with gumma in the region of the gall bladder may present the same picture as cancer of the gall bladder.

#### *Treatment*

Prophylactic. In view of the figures cited on the relation of calculus to cancerous gall bladders removal of gall bladders from patients who have a history of gall stones, colic, chronic cholecystitis and in those in whom stones are found accidentally is indicated. The removal of dis-

eased gall bladders may prove to be of value in the prevention of the development of cancer of the gall bladder. Judd and Baumgartner stated that the frequency of cancer of the gall bladder had diminished from 5 per cent in 1902 to about 0.5 per cent in 1935. They attributed this result to the fact that diseased gall bladders are now removed much earlier.

**Medical.** This type of treatment is only palliative and is employed as symptoms arise.

**Surgical.** The results of surgical treatment in cancer of the gall bladder are not satisfactory. The condition is usually inoperable when the patient is subjected to operation, and exploration with removal of tissue for biopsy is the procedure performed in the majority of cases.

Erdmann takes the position that in his series of cases the incidence of malignancy was considerably less than the mortality of gall bladder surgery, and he feels unjustified to advise cholecystectomy for prophylactic reasons. Graham takes the opposite view and points out that removal offers the only hope of cure at the present time and that the operative risk for uncomplicated cholelithiasis is less than 1 per cent, which is 20 to 25 per cent less than the mortality of cancer. This justifies his advising cholecystectomy for stones as a prophylactic measure, particularly for individuals in the cancer age or with a hereditary predisposition to cancer.

A satisfactory procedure in dealing with cases in which carcinoma of the gall bladder or biliary ducts is suspected is to institute a short period of observation in a hospital. Duodenal drainage is attempted and solutions of glucose and sodium chloride, with the addition of calcium chloride, are injected intravenously. Transfusions of blood and the correction of vitamin and nutritional deficiencies are of distinct benefit. If no bile is obtained after repeated efforts at duodenal drainage, and if the concentration of serum bilirubin remains stationary or shows any tendency to increase, the deduction that complete biliary occlusion has occurred is in order and immediate operation must be done to re-establish the flow of bile. On the other hand, if bile is obtained through the duodenal tube and the concentration of serum bilirubin shows a tendency to decrease, operation may be delayed until the value for serum bilirubin has become low and constant, and the patient is prepared as satisfactorily as possible.

The surgical treatment of patients with malignant disease of the gall bladder is palliative or radical. In 172 (55.1 per cent) of 312 cases of cancer of the gall bladder and biliary ducts reported by Judd and Gray, exploratory operation with re-

moval of tissue for diagnosis was the only procedure attempted. In 59 cases it was possible to remove the gall bladder. In 42 cases cholecystostomy only was done, and in 9 the gall bladder was removed and the common duct drained at the same time.

Anastomosis was made in 27 cases in which the common duct was involved. In the majority of them cholecystogastrostomy was performed, cholecystoduodenostomy was performed in 9 cases, and cholecystojejunostomy in 1 case.

The type of surgical treatment indicated depends entirely on the location and extent of the growth.

**Prognosis.** Every series on record gives a discouraging and gloomy picture. The various reports of surgical cures vary from 0 to 6 per cent.

In Smithies' series only 2 patients were alive at the end of four years, 21 others died immediately or within eight months after operation. In the 19 cases of Shelley and Ross, 14 patients were dead within three weeks of operation, and only 1 was alive and well at the end of six months.

Cooper in a series of 48 cases reported the immediate operative mortality as 38 per cent, with the average duration of life in 13 survivors as thirteen and one half months, and a possible cure in 1 case.

Quinn collected 57 cases in which cancerous gall bladders had been removed. Fifty of the patients died within a year and 2 at the end of one year. Five were reported living at twenty months, 1 at twenty six months, 2 at three years, and 1 at four years and six months.

In a series of 84 cases reported by Magoun and Renshaw the immediate operative mortality was 10 per cent. Among the 29 patients on whom only explorations were done the greatest length of life was three years. Of the 26 patients on whom cholecystectomy was done 6 were alive, 3 at two years, 1 at eight years, 1 at nine years, and 1 at 11 years. The last showed the greatest length of life for the group. Twelve did not live longer than a year.

In 1927 Webber made an effort by means of Broders' method of grading malignancy to determine a relationship between the span of life of patients after operation and the grade of malignancy of primary carcinomas of gall bladders removed at operation.

In 1915 Broders introduced the method of estimating the relative malignancy of squamous cell epitheliomas by grading, or expressing on a scale of from one to four the amount of differentiated or mature epithelium in a microscopic section of a tumor. This method has helped the sur-

geon to decide on the kind of treatment to be instituted and to determine the prognosis.

Webber, in reporting 30 cases of primary carcinoma of the gall bladder found that in 12 of these in which the growths were graded two or less, the patients lived on the average of two years and ten months. Fourteen patients with carcinoma graded three or more lived an average of four and eight tenths months. Of 12 tumors graded two or less only 4 were found associated with extension or metastases at operation. Of 14 tumors graded three or more 13 were found to be associated with similar evidence of extension or metastases at operation. Sixty five per cent of the cases graded showed a grade of three or more. Webber concluded that determination of the grade of malignancy through a study of the cell differentiation in a microscopic section of the tumor appeared to be a definite aid in the estimation of both the probability of metastases and the relative length of life of the patient after operation.

**Summary.** The importance of early diagnosis of malignant lesions of the gall bladder cannot be overemphasized. Since it is impossible to recognize a distinct clinical picture of cancer of the gall bladder the condition should be kept in mind in order that treatment may be instituted while the disease is temporarily controllable.

Whether stones may be an etiological factor in the production of malignancy of the gall bladder is not known. However the high incidence of gall stones in association with this condition cannot be overlooked and presents an important factor in deciding for or against their removal when first encountered.

About 70 or 80 per cent of all cases of carcinoma of the gall bladder occur in women. The majority of the patients are between fifty and seventy years of age but cases are recorded in patients as young as twenty three and as old as ninety.

The clinical picture of carcinoma of the gall bladder is not well defined and depends entirely on the location of the lesion, extension, metastases, complications and on associated conditions such as infection, the presence of stones and pancreatitis.

The surgical treatment of carcinoma of the gall bladder may be palliative or radical. Exploratory operation with removal of tissue for diagnosis is the procedure performed in the majority of cases. The operative mortality is high and is reported to be between 10 and 38 per cent, the majority of patients with this condition are dead within a year.

The incidence of malignancy of the gall bladder is about 0.5 per cent. Although the symptoms of

malignancy are not definite about 70 per cent of the patients have a long history of repeated gall bladder attacks followed by a short period of constant pain, anorexia, vomiting, cachexia, progressive weakness, and loss of weight of about six months duration.

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# SURGERY OF THE ABDOMEN

## ABDOMINAL WALL AND PERITONEUM

McClure R D and Fallis L S Femoral Hernia  
Ann Surg 1939 109 987

Femoral hernias are rare. There have been only 90 operations for femoral hernia at the Henry Ford Hospital during a twenty year period. In contrast 4,530 operations for inguinal hernia were performed. The ratio therefore is approximately 50 to 1.

In analyzing this series of 90 cases the authors found that male outnumbered females by 50 per cent, which fact they attributed to a large industrial practice. Femoral hernias tend to occur most frequently between the ages of thirty and sixty or a decade later than inguinal hernias. Only 24.4 per cent of the patients gave a history of trauma in connection with the appearance of the hernia. Obesity and pregnancy seemed to play little part in the production of femoral hernias. In a considerable proportion of the cases analyzed there was an associated inguinal hernia, which indicates the advisability of examining the femoral canal in all operations for inguinal hernia. Femoral hernias occur more frequently on the right side. Untreated femoral hernias are potentially much more dangerous than untreated inguinal hernias as evidenced by the fact that 23.3 per cent of the series were admitted because of incarceration and in 36.4 per cent of these cases there was interference with the intestinal blood supply.

The principal error in diagnosis was that of mistaking femoral hernias for inguinal hernias. This mistake was particularly prone to occur in obese females. The authors point out that this error in



Fig 2 A purse string suture of silk is closing the peritoneum proximal to the neck of the femoral hernial sac. The latter will be cut away with the remaining redundant peritoneum (Courtesy of J. B. Lippincott Co)

diagnosis was of no consequence if the inguinal approach, which they favor, was used.

The classic operation of Bassini, as compared with the inguinal operation, gave approximately the same rate of recurrence, the advantage being slightly in favor of the inguinal approach. The inguinal operation employed was that of Lotheissen, i.e. suture of the conjoint tendon to Cooper's ligament in order to close the superior orifice of the femoral canal. The Moschowitz and the Roux operations are discussed briefly. The authors believe that strips of fascia threaded through Poupart's and Gimbernat's ligament will prove advantageous in the repair of large femoral hernias.

Although the Bassini operation is easier than the inguinal, the latter is advocated in all cases in which the sac contains omentum or intestine. Not only is the management of a damaged loop of intestine easier with this approach, but the danger of injury to the bladder or to an aberrant obturator artery is minimized also.

A simplified method of isolation of the femoral sac is described. The usual procedure of exposure of the cord or round ligament in the inguinal canal is performed as in the treatment of an inguinal hernia. The potential indirect inguinal hernial sac, which is found lying along the upper portion of the cord, is picked up and opened (Fig 1) to permit the examination of the femoral hernia. Then with traction on the medial margin of the opened peritoneum the entire femoral hernial sac is delivered into the wound. If the sac is unusually adherent, the skin can be retracted to a point below Poupart's ligament and the

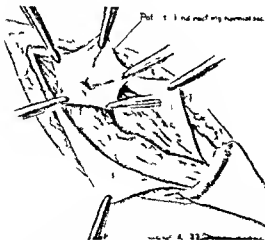


Fig 1 The potential indirect inguinal hernial sac has been separated from the structure of the spermatic cord and opened.

sac mobilized in the femoral canal which permits the sac to be delivered above Poupart's ligament. Closure of the peritoneal opening is affected by means of a purse string suture (Fig. 2) the femoral sac and redundant peritoneum being trimmed away. The fascia transversalis is then incised and the superior opening of the femoral canal identified and closed. The divided inguinal structures are then sutured as in an inguinal hernia, the cord being transplanted above the conjoined tendon and internal oblique muscle. Silk is used in all repairs of femoral hernia unless a contraindication exists such as a strangulated hernia when the possibility of intestinal resection is present. Complications occurred in 4.4 per cent of the cases reported and there was an operative mortality of 4.4 per cent.

A case report of an acute condition of a gangrenous appendix located in a femoral sac is included in the report.

LUTHER H. WOLFF, M.D.

**Ducastaing R.** *Pneumococcus Peritonitis Clinical and Therapeutic Considerations* (A propos des péritonites à pneumocoques. Considérations cliniques et thérapeutiques). *J de chir.* 1939 34 62

Ducastaing in reporting 8 cases of pneumococcus peritonitis, presents also the clinical and therapeutic features. All of his patients were females, 5 children and 3 adults. Seven patients were operated upon hurriedly because of generalized peritonitis. The eighth case was that of a woman who had been delivered two and one half months previously and who had been operated upon for localized peritonitis. All 8 patients recovered.

Ducastaing states that the portal of entry of the organism whether the vagina, the intestines, or the blood stream is still debatable. The diagnosis is very difficult. Diarrhea, vomiting and fever are not especially characteristic of the disease. Diarrhea may be absent, there may be nausea without vomiting and the temperature may be only slightly elevated or perhaps even very high. Herpes of the vulva if present is a presumptive sign. Abdominal pain is usually more diffuse than in acute appendicitis and the rigidity is less marked, though if present it is frequently more marked in the right lower quadrant. The pulse may be very high but the facies are not as toxic appearing as in generalized peritonitis. At operation there may be slight congestion of the ileocecum and a few deposits of fibrin, and the appendix is intact. There is no odor to the pus which is yellowish green and sometimes very abundant.

Ducastaing advocates quick abdominal exploration by means of a small incision with a minimum amount of shock and intra abdominal exploration to evacuate the pus. In 7 of his cases the appendectomy and drainage was accomplished in only a few minutes. He stresses the importance of a rapid operation. He makes no statement regarding the efficacy of anti pneumococcus serum since it was employed in only 1 case with no appreciable result.

FREDERIC W. ILFELD, M.D.

## GASTRO-INTESTINAL TRACT

**Bulmer E.** *A Gastroscopic Study of Roentgenologically Negative Dyspepsia*. *Brit. M. J.* 1939 2 108

In reviewing the records of 10,000 out patients with digestive disorders at the General Hospital in Birmingham, Bulmer has listed 1,575 cases which fall in a 'gastroduodenal' group. Of these, 250 were gastroscopied, 147 having roentgenologically negative or inconclusive findings. It is these 147 cases in which he is primarily interested.

In 66 patients no gastroscopic abnormalities were found. (The author fully recognizes the existence of blind areas and for that reason is reluctant to accept a negative gastroscopic examination as always conclusive.) Sixty patients, however, presented some form of chronic gastritis: 9 had ulcers, and 1 an inoperable carcinoma. Failure to make an adequate examination was experienced in 9 cases. One simple ulcer was later shown to be an ulcer carcinoma.

The author further separates from this group of 147 cases a group of 117 cases in which the x-ray findings were entirely negative. Fifty nine of these were gastroscopically negative. 45 presented some type of chronic gastritis, 7 revealed gastric ulcers and 6 could not be diagnosed because of an inadequate examination.

In 46 patients the types of chronic gastritis were classified according to Schindler's classification. The most common type was a chronic superficial gastritis occurring in approximately 65 per cent of the cases, chronic hypertrophic gastritis was found in 17 per cent, and atrophic gastritis was found in only 6 per cent. The rest of the cases were of indeterminate type, not atrophic.

The author concludes his article by stating that the recognition of chronic gastritis as a common cause of obscure dyspepsia is necessary and an inspection of the gastric mucous membrane is essential when the history, gastric chemistry, and roentgenological examinations are all inconclusive or negative.

EDMUND A. GORVETT, M.D.

**Clausen J. and Ringsted A.** *On Pre Operative and Postoperative Fluid Treatment in Pyloric Stenosis*. *Acta chirurg. Scand.* 1939 82 365

Observations were made on 6 patients with pyloric obstruction in an effort to determine when the fluid balance was in equilibrium, both before and following operation. The clinical picture of the patient was observed with special reference to the general turgor and the state of the tongue. The weight likewise was recorded at the start and end of the fluid treatment. The amount of diuresis was recorded, as well as the kidney function based on the urea clearance test. The serum chlorine and urine chlorine concentrations were determined together with the chlorine balance, that is, the ratio between the intake and output of chlorine for twenty four hours was determined. The authors

found that it was impossible by clinical examination alone including inspection of the tongue to estimate the degree of dehydration with accuracy. They found that it might be necessary to give as much as 10 liters of saline solution to restore the electrolytic balance. Furthermore, that the state of hydration could not be accurately determined by separate estimations of the serum or urine chlorine. They found that it was necessary to carry out simultaneous determinations of the serum chlorine and twenty-four hour urine chlorine concentrations to estimate accurately the degree of rehydration.

They emphasize the importance of determining the serum protein concentration of the blood to avoid the complication of proteinemia. Blood transfusions are advisable at this stage to increase the serum protein concentration. In the presence of almost complete obstruction 100 gm. of glucose are given daily several days previous to operation, in the form of 5 per cent glucose or by adding 5 per cent glucose to the saline solution. This counteracts possible ketosis, supplies some caloric value to the patient and stimulates the detoxifying function of the liver. The administration of isotonic glucose solution after operation to counteract the total physiological fluid loss is advised and isotonic saline solution is given to replace the non physiological fluid loss until rehydration is complete.

ROBERT ZOLLINGER M D

**Bauer and Stanjek** A Report on 1281 Cases of Gastric Cancer Observed during a Period of More Than Fifteen Years (Bensch ueber 1281 Faelle von Magenkrebs aus 15 Jahren Beobachtungzeit) *Zentralbl f Chir* 1939 p 2739

Thirty women and 70 men with gastric cancer were observed by the authors. However, in gastric cancer of young people under thirty years of age they found three times as many women as men. The prognosis of gastric cancer in the youthful individual is not unequivocally bad in the authors' material: a girl of thirteen years is still living five years after the operation and is able to work as well as ever. Of course gastric cancer is seen most often between the fortieth and sixtieth years.

In 12 of the authors' cases the condition was too late for operation. Neither age nor sex had any influence on the operability; neither did the duration of the disease play any too pronounced a rôle in the patients who had suffered for less than three months only 31 per cent were operable, while of those with symptoms of more than a year's duration operation was feasible in 39 per cent. The last figures apply to the material of Burgdorf; in the authors' patients conditions were not so favorable: resection was possible in 34 per cent of their cases. The mortality for the resected cases was 26.8 per cent and rose immediately when, as in the authors' material only 22 instances of gastrocolic resection and total extirpation of the stomach were added. Palliative procedures are always justified as they may extend the duration of life of the patients in whom a gastro-

enterostomy was all that was done: only 13.4 per cent were living some years later while of those subjected to palliative procedures 44.8 per cent were still alive one year later.

In the discussion FROMME reported his results with 812 gastric carcinomas. It is immediately evident that the mortality is lower in resections: this is explained by the fact that in advanced carcinoma creeping up toward the cardia the patient is no longer importuned to submit to this operation. Liver metastases even distant irremovable glands do not constitute a contraindication for local resection; patients frequently live without suffering for several months following removal of a disintegrating cancer.

Schoene reported the case of a patient in whom at operation there was thought to be an extremely large gastric carcinoma. Since in this instance radical procedures did not seem possible the stomach was brought up and sutured to the abdominal wall and the area was subjected to a course of irradiation treatment. During the course of the treatment the stomach broke open and later became markedly shrunken. Afterward the patient underwent two operations during which no further evidence of the tumor could be found. Schoene was unable to explain the character of this occurrence as biopsy was not done.

FISCHER alluded to the prime importance of early recognition of the presence of gastric carcinoma.

BAUER in his closing remarks emphasized the need for striving ever for more extensive resections. (ARTICLE) JOHN W. BRYNAN M D

**Marshall S F** The Technique of Subtotal Gastrectomy *Surg Clin North Am* 1939 19 607

In a study of 130 cases of subtotal gastrectomy for ulcer, Marshall states that partial removal of the stomach is now an accepted method of surgical management for benign ulcers of the stomach and duodenum. In the experience of the Lahey Clinic but 8 per cent of the patients with duodenal ulcers and 23 per cent of those with gastric ulcers require operation for relief of their symptoms. The indications for operation are: (1) ulcers which are intractable to medical management; (2) two or more gross hemorrhages; (3) ulcers which have perforated; (4) pyloric obstruction which is not amenable to medical management; and (5) gastric ulcers in which a question of malignancy arises.

During the past two years subtotal gastrectomy for ulcer of the stomach or duodenum was performed in 63 consecutive cases with 1 fatality. In 9 of these cases resection had been performed for gastrojejunal ulcer arising after a previous gastro-enterostomy and in 1 case an extensive resection for gastrojejunal colic fistula had been done.

If gastric resection appears advisable at least from three quarters to four fifths of the stomach should be removed to change appreciably the gastric secretion. The Clinic uses the Hofmeister modification of the Billroth II operation (Fig 1). This

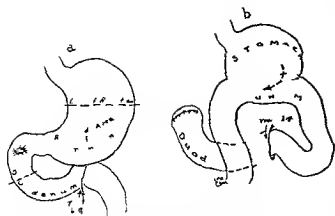


Fig 1 Hofmeister method of subtotal resection of the stomach a extent of stomach and duodenal resection b, Hofmeister type of gastrojejunostomy

method can be employed for either ulcer or in radical resection of the stomach for carcinoma with wide removal of the tumor and the involved glands.

Through a left rectus incision an abdominal exploration is first carried out. The location of the common bile duct and in the case of ulcer its relation to the duodenal ulcer are determined by incision of the gastrohepatic omentum and mobilization of the convex border of the duodenum. The stomach is mobilized next. Vessels in the gastrocolic omentum are divided and ligated, the pylorus and duodenum are separated from the pancreas and all vessels are ligated as the mobilization progresses. The division and ligation of the right and left gastric arteries together with vessels of the gastrohepatic omentum allow mobilization of the lesser curvature of the stomach and superior border of the duodenum. The duodenum is divided between clamps with the cautery and closed by inversion of the mucosa. The von Petz sewing machine clamp is next applied across the mobilized stomach, and the stomach is divided by cautery between a double row of clips. The jejunum is then brought anterior to the transverse colon and anastomosed to the stomach after removal of the clips. Marshall states that it makes little difference whether the proximal jejunal loop is placed at the greater curvature or the lesser curvature of the stomach. The angles are reinforced with silk sutures and by suture of the divided gastrocolic and gastrohepatic omentum onto them. The wound is then closed in layers.

Marshall routinely gives a blood transfusion after the operation. A Levine nasal tube is introduced into the stomach and left there until the stomach is draining satisfactorily. Feeding is begun after from thirty six to forty eight hours by the hourly administration of small quantities of water. To this are added gradually other types of food as tolerated. Marshall uses nupercaine in a 1:500 dilution for spinal anesthesia.

In the case of an indurated adherent duodenal ulcer which cannot be removed, Marshall advocates division through the duodenum above the ulcer or

just proximal to the pylorus with a high subtotal gastrectomy on the remnant of the stomach.

FREDERIC W ILFELD M D

Storck, A Rothschild J E, and Ochsner, A  
Intestinal Obstruction Due to Intraluminal Foreign Bodies *Ann Surg* 1939 109 844

Fifty one cases of intestinal obstruction due to intraluminal foreign bodies form the basis for this review. The causes of this type of ileus are classified as follows:

(1) gallstones, (2) intestinal parasites, (3) fecaliths (4) enteroliths (5) concretions (6) bezoars, (7) food bolus, (8) miscellaneous foreign bodies, and (9) mechanical ileus and epithelial casts.

The similarity in the gross appearance of gallstones, fecaliths, enteroliths, and intestinal concretions, as well as of some types of bezoars, often makes chemical or microscopic examination necessary for accurate identification of the foreign bodies.

The development of intraluminal obstruction is related to a variety of predisposing factors. Occupation may be a predisposing cause as in the instance of furniture workers, in whom concretions are formed as a result of drinking shellac and concretions of raw latex or caoutchouc have been observed in workers with this substance. Economic conditions which influence the food supply may be of importance as exemplified by cases of obstruction which occurred during the World War, when oats were rationed as food in Russia and when 'ammunition bread' was resorted to in Germany. The custom of eating grasshoppers in the Belgian Congo has been responsible for the development of intestinal obstruction. Stenosis of the intestinal lumen as well as kinking or angulation of the intestine, may serve as a predisposing cause of intraluminal obstruction. Deficient digestive juices may be responsible for incomplete disintegration of food with the resulting formation of an obstructing food bolus. Constipation acts as a predisposing cause in the development of fecalith obstruction. Psychological aberrations such as those responsible for the habit of hair swallowing may lead to intraluminal obstruction.

Exciting causes of intraluminal obstruction include improper eating habits such as insufficient mastication by the hurried adult, food bolting by children eating without normal or artificial teeth, dilution of the digestive secretions by excessive quantities of water with meals and overloading of the intestinal tract with large amounts of food. The character of the food is significant in the development of food bolus obstruction, as such obstructions are almost invariably preceded by the ingestion of desiccated or fiber rich food. The character of the foodstuff is also important as in the instance of ileus due to persimmons, the skins of which contain a substance which when precipitated by hydrochloric acid holds together the seeds, fibers, and pieces of skin in the form of a bezoar. Excessive amounts of gas in the intestine has been cited as an exciting cause. The administration of a vermifuge can precipitate

ileus in individuals with heavy infestations of intestinal parasites

The pathological changes are the same as those which are usually present in ileus due to other causes. Intussusception may occur as a result of intestinal spasm associated with hyperperistalsis in individuals harboring intestinal parasites. Intramural vascular strangulation may be produced by excessive distention of the intestine. Local pressure necrosis is likely to occur in the presence of gall stones, enteroliths, fecaliths, intestinal calculi, hard bezoars and concretions. Perforation at a site of lowered tissue resistance has been observed in association with intestinal parasite infestation.

The clinical picture in intestinal obstruction due to an intraluminal foreign body is essentially the same as that in intestinal obstruction due to other causes, but absence of an obvious cause of the ileus frequently leads to delay in the diagnosis and to dangerously long periods of observation. Physical findings are essentially the same as those resulting from ileus due to other mechanical causes. Roentgenological findings in intraluminal obstruction consist of abnormal accumulation of gas or fluid and the possibility of visualizing the foreign body makes plain roentgenography of the abdomen advisable. Differential diagnosis is frequently difficult and depending upon the acuteness or the chronicity of the symptoms it may be necessary to differentiate intraluminal ileus from acute gastroenteritis, acute appendicitis and other acute surgical conditions or even intestinal neoplasia.

Intestinal perforation and peritonitis occurred in 3 of the cases reported and is a frequent complication of obstruction due to the hard foreign bodies, notably fecaliths, enteroliths, concretions, phytohezoars and gall stones. In 2 patients an internal hernia existed in conjunction with the intraluminal obstruction. In 1 instance obstruction due to a fecalith was associated with an inguinal hernia. A peptic ulcer complicated the case. A residual stenosis following regional enteritis served as a predisposing factor in 1 patient with intestinal parasite obstruction. A dioppyrohezoar was present in the stomach of 1 patient.

Non-operative therapy may be conservative, radical or palliative. Conservative non-operative treatment consists of the administration of supportive measures, such as venoclysis, the application of heat to the abdomen, withholding food by mouth, institution of gastroduodenal suction, administration of antispasmodics such as atropine or belladonna and occasionally the employment of enemas. Such treatment, especially in the instance of food bolus and intestinal parasite obstructions, may be adequate, but many bad results which are credited to the operative method of treatment are due to unwarranted persistence in the application of conservative methods. The radical non-operative treatment which consists of the administration of purgatives and vermifuges without knowledge of the extent and character of the obstruction is considered danger-

ous. Palliative conservative treatment may be necessary in the instance of extremely ill patients when more radical treatment is inadvisable.

Operative treatment may also be conservative, radical or palliative. Conservative operative treatment consists of exploratory celiotomy and this sometimes may be supplemented by dissection or displacement of the obstructing mass, a procedure which provides the advantage of not incising the intestine while at the same time affords relief of impaction. Radical operative therapy may consist of enterotomy, enterostomy, extensioization, stripping out the contents of the intestine or resection. Of these various operations, enterotomy appears to be the ideal procedure. Fixation of a loop of intestine to the abdominal wall with the attendant danger of secondary intestinal obstruction constitutes a definite objection to enterostomy. Extensioization of a loop may be necessary as a life-saving procedure. Resection is rarely indicated and is to be avoided except when its employment is imperative. Stripping or milking out the contents of the obstructed bowel, although occasionally necessary in order to permit reposition of the intestine following accidental or intentional evisceration, should usually be avoided as this procedure causes adynamic ileus and shock which later is likely to cause death because of the persistent lowering of the blood pressure. Palliative enterostomy may be necessary when it is impossible to locate the cause of the obstruction or when no more extensive procedure seems warranted.

The following is offered as a guide in the selection of the type of management in cases of intestinal obstruction due to intraluminal foreign bodies, especially when the exact cause of the obstruction is not known.

#### I. Indications for conservative treatment or delay in the institution of surgical treatment

##### A. Early cases

1. Very short interval since onset of symptoms
  - (a) Absence of significant or definite roentgenological findings
2. Indefinite evidence of mechanical obstruction and especially the absence of findings suggesting intussusception, volvulus or mesenteric thrombosis

##### B. Moderately advanced cases

1. No indications for delay except extremely rapid and complete relief following a short period of conservative treatment. This applies in particular to elderly, extremely obese patients or to patients who are otherwise poor risks.

##### C. Advanced cases with pronounced dehydration and distention in which pre-operative preparation is imperative should at least receive preliminary conservative treatment. In many of these cases a totally conservative management offers the only likely chance of survival.

## II Indications for early or immediate operative intervention

- A Clinically indefinite early or moderately advanced cases with, however, roentgenographically demonstrable calculus, enteroliths, gall stones or fecalith
- B Early cases with definite symptoms or signs of obstruction with or without significant roentgenographic findings such as abnormal gas accumulations or fluid levels
- C Questionable or borderline cases in which symptoms or signs suggestive of intestinal obstruction persist following a short period of non operative treatment
- D Moderately advanced cases with intussusception, volvulus or mesenteric thrombosis
- E Palpation of an abnormal mass
- F Evidence of perforation

Non resilient foreign bodies such as gall stones, fecaliths, enteroliths, concretions and the bezoars of hard consistency which will not spontaneously change their form and which are likely to become progressively more firmly impacted require early operative removal. The relatively soft, compressible, or malleable foreign bodies such as food bolus and intestinal parasites, are not so likely to cause erosion of the bowel. Therefore, patients with obstruction due to these two causes may frequently be kept under observation, or treated conservatively.

In the 17 patients in whom enterostomy was performed, the mortality was 70.5 per cent. In the 9 patients in whom non operative therapy was used the mortality was 44.4 per cent. The mortality following either exploratory celiotomy or displacement of the obstruction was equal, being in each instance 25 per cent. Of the 13 patients in whom enterotomy was performed 23 per cent died. The fatality rate for the group in which enterotomy was performed was only one third as great as that for the group in which enterostomy was performed but the group in which the latter procedure was employed included many cases of advanced obstruction.

## Cendel S. and Fine J. The Effect of Acute Intestinal Obstruction on the Blood and Plasma Volumes. *Ann Surg* 1939, 110 25

In a study of 18 dogs the effects of intestinal distention on the volume of the plasma and on the total blood volume are presented. Four groups of dogs were studied. The first group consisting of 2 dogs was a control. These dogs were kept under intraperitoneal nembutal anesthesia until death occurred. The second group consisting of 2 dogs were prepared as follows:

After twenty four hours, during which time only water was allowed so that the small intestine would be empty and collapsed intraperitoneal nembutal was administered and an occluding ligature was placed around the pylorus. The terminal ileum was divided, the distal end inverted and a cannula was inserted into the proximal end brought out through a stab wound and clamped off.

The third group included 11 dogs which were prepared similarly to those of the second group, except that the cannula entering the proximal loop of ileum was connected to a Peruse pressure bottle. The entire small intestine was then continuously inflated with air at a constant level of pressure. Fifteen cm. of water pressure was used in 6 dogs, 20 cm. in 4, and 30 cm. in 1.

The fourth group consisting of 3 dogs was treated in the same manner as the preceding group except that pressures were high enough to cause circulatory strangulation.

Thus in the second group the pathological factor was obstruction in the third group obstruction and distention, and in the fourth group obstruction, distention, and strangulation. All the dogs were kept under intraperitoneal nembutal anesthesia until death occurred. Plasma volume determinations were made at various time intervals, and total blood volume figures were calculated from the former and hematocrit readings.

The conclusions were that dogs with intestinal obstruction die more rapidly if distention is present than if it is not. If strangulation is superimposed on the distention, death occurs even more rapidly. Distention of the obstructed intestine in dogs causes an early and progressive loss of blood plasma which is sufficient to cause death. Distention *per se* does not cause a loss of fluids into the intestinal lumen, bowel wall or peritoneal cavity. The magnitude of the plasma loss due to distention alone is sufficient to indicate that the all important need for immediate decompression of the intestine must be accompanied by the administration of adequate quantities of plasma. The volume of plasma necessary to restore the normal plasma volume is far in excess of the amount commonly given to obstructed patients in clinical practice. Plasma is of more importance than whole blood or intravenous fluids and should be given long before symptoms of shock arise.

SIMNEY S. QUARRER, M.D.

## Mesa C. Enterocutaneous Fistulas (Fistulas enterocutáneas completas). *Rev de ciruj de Buenos Aires* 1939 18 No 3

Among the enteric fistulas there is the enterocutaneous type, in which the small intestine opens into the abdominal skin at both ends because of the loss of a part of its wall. The ends may be parallel like the barrels of a gun, or they may form a tightly closed angle.

Ectropion of the mucosa is quite marked; there is a total interruption of the enteric tract and the whole intestinal contents are expelled through the fistula. Feces and gases are not eliminated through the natural passages. These fistulas are especially serious when their localization is high and, as caecemia rapidly ensues, immediate operation is required.

Fistulas of the first 30 in. of the small intestine, which we may consider the jejunum, are extremely serious. They always occur following laparotomies.

for acute abdominal conditions in which destruction of the abdominal wall has been found. Such destruction could be produced by shot wounds, knife wounds, contusions, ileus or volvulus or it may appear where the surgeon has performed enterotomies, resections and other operations.

The symptoms are local and general locally at the base of the operative wound one may see some intestinal loops adhering to one another and one of them containing a hole of varying dimensions. The mucous membrane shows through it and there is a large discharge of enteric fluid. In a few days the hole becomes larger and the spur more important. The two intestinal ends can be seen separated by the spur and through the afferent one there is a flow of fluid which represents all the ingested food.

The skin around the mouth of the fistula presents important lesions which result from the autogenous digestion of the tissues. There is a very vivid red scarring which is extremely painful and in time deep bleeding ulcerations can easily be seen.

The general symptoms are very alarming and progress quickly. The patient becomes dehydrated and loses weight at once. The pulse is quickened and very weak, the facies shows a deep depression, the eyes are sunken and the cheek bones bulge. The tongue is dry and there is an intense sensation of thirst and hunger. The tendency to collapse, hypothermia, mental depression and deep emaciation are so severe that if the surgeon does not take the necessary steps at once, death of the patient very often ensues.

In regard to treatment, the author advocates an entero-enterostomy near the fistula followed by section of the spur and closure of the intestinal stumps.

The first stage must be performed early without regard to the condition of the skin; it is done to prevent the loss of fluids. In this way the general condition of the patient becomes more suitable for the treatment to follow. This first stage consists of an entero-enterostomy at a distance of 2 in. from the fistula which is kept as a security valve.

Palpation of the loops which is very important before the operation reveals the respective direction, motility and position of these loops so as to make possible the choice of the best procedure. Thus if the loops stick together like the barrels of a gun, the anastomosis can be made with a Murphy button introduced through one of the fistulous openings. If they do not stick together but form a more or less acute angle, interposed loops will sometimes exist and if the findings at exploration permit, these loops may be approximated to the external iliac fossa. At this point an extraperitoneal anastomosis can be made as was done in a case cited by Finochietto.

As soon as the anastomosis can function regularly usually after the operative reaction has disappeared the fistula may be somewhat packed. In this way the loss of fluids is progressively decreased and a definite improvement takes place in the skin.

The second stage of the operation is closure of the fistulous mouth which must be performed as soon

as the patient is in a better general condition. It consists in section of the spur and suture of the stumps with previous freshening of the lips.

A very important fact is that none of the cases of the author or of Finochietto has shown any signs of evagination even after very long and troubled post-operative periods.

HECTOR MARINO M.D.

**Decoulx P. Retroperitoneal Traumatic Rupture of the Duodenum (Rupture traumatique rétro-péritonéale du duodénum)** *Rev. de chir. Par.* 1939 58 274

The author discusses retroperitoneal traumatic rupture of the duodenum on the basis of a review of the literature and a case in a man forty-nine years of age which is described in detail. The termination of such cases is usually fatal especially if operation is late. In spite of the voluminous literature on the subject not more than about 100 cases have been reported. Incomplete ruptures not involving the mucosa may heal but in most cases the mucosa is finally weakened and ruptures in a second stage. In complete ruptures the intestinal lumen is opened. In partial ruptures only a part of the circumference is involved by a mere puncture or a longitudinal or transverse fissure. Finally the intestine may be cut in two as is usually the case in children. This form of total rupture is quite common (up to 22 per cent according to Lenormant) in the intraperitoneal or extraperitoneal lesions but most rare in the retroperitoneal type. Only 2 such cases have been reported. The sites of predilection appear to be the extremities of the duodenum, the pyloric zone and the angle of Treitz. Only about one fourth of the cases involve the third portion.

The mechanism of the production of rupture varies according to the direction and form of the injury. Laceration is most common in regions where the duodenum is fixed by solid attachments at the angle of Treitz or the superior flexure. The intestine may be crushed against the spine especially in its third portion in which case the condition is usually associated with other lesions particularly rupture of the pancreas. The most common type of rupture seems to be that produced by bursting. The present case is the only one reported in which the rupture was due to a motor accident.

Following rupture the fluid escape into the cellular spaces may detach the mesocolon, the mesentery but in particular the pancreas and flow into the perirenal region and even into the iliac fossa. The infiltration consists of food, biliary fluids, pancreatic juice, gas and blood.

Symptoms are so atypical that a diagnosis is rarely made before the intervention. In spite of the absence of peritoneal inundation the clinical syndrome greatly resembles that of perforation peritonitis. The hourly acceleration of the pulse indicates a severe abdominal lesion. The facies becomes typical but not until later. One cannot count upon the disappearance of hepatic dullness because the peritoneum does not contain gas. Abdominal



contraction is marked and early. The peritoneal symptoms do not appear immediately. There is often a free interval of from five to six hours, or several days during which nothing indicates a serious lesion. The patient observed by the author walked a distance of several kilometers and slept several hours, the alarming symptoms not appearing until eight hours after the accident. Other special symptoms which may develop are testicular pain, emphysema of the anterior abdominal wall, and deep prevertebral tumor. Sperling diagnosed 1 case roentgenographically.

If operation is not performed, death ensues within a short time. Only a very careful exploration at operation will prevent the oversight of such a lesion. Diagnostic signs of aid include subperitoneal emphysema and a green spot in the submesocolic region.

In the smaller punctiform ruptures the continuity of the intestinal tract may be restored by lateral suture with linear or purse string suture. If the duodenal caliber is constricted, a gastro-enterostomy may be required. In severe or total rupture, lateral suture becomes impossible. If the rupture is not total it may be necessary to complete it with excision of the entire bruised area. Opening of the two duodenal stumps to the skin or simple tamponade are merely procedures of last resort which usually fail.

The digestive canal must be reestablished by one of several possible methods: (1) end to end suture, which gave successful results in 1 case reported by Kantor but is too risky to be recommended; (2) closure of the upper end and opening of the lower end into the stomach; (3) closure of the lower end and opening of the upper end into the small intestine; and (4) closure of both ends with purse string invagination.

The last method is used in almost all cases. Gastro-enterostomy is then required to restore the continuity of the intestinal tube. Other procedures found of use include Finney's pyloroplasty and the complementary duodenojejunostomy recommended by Guibé. Anastomosis may be accomplished more simply at the level of the pylorus by Delbet's technique of gastroduodenojejunostomy. If the rupture is located at the ampulla of Vater, operation becomes most difficult. Occasionally lateral suture is possible but if the rupture is too extensive, a reimplantation of the papilla or even reimplantation of the pancreatic section into the intestine (Kausch) may be necessary. Even in the absence of such unfavorable conditions the long difficult operations required for ruptures of the duodenum explain the poor prognosis of such accidents. Of 34 cases published by Rudolsky in 1927 only 5 terminated in recovery.

EDITH SCHANCHIE MOORE

Porter J E and Whelan C S. Argentaffine Tumors. Report of 84 Cases. 3 with Metastases. *Am J Cancer*, 1939 36 343.

A series of 84 argentaffine tumors is reported. Three of these, arising in the small intestine, were

malignant. Eighteen malignant argentaffine tumors not previously tabulated have been discovered in the literature, which brings the number to 64, with out the 3 described here.

Argentaffinomas are encountered in from 0.2 to 0.5 per cent of appendices removed at operation. Because of their similarity to carcinooma and the nature of the cells involved, argentaffine tumors have been a source of much interest and speculation. The gross appearance of these tumors is quite characteristic and constant. They usually occur in the tip of the appendix which is generally obliterated and shows a bulbous swelling. The overlying serosa is pale and smooth. The cut surface of the tumor is of a pale yellow color with delicate whitish gray interlacing strands of tissue which vary with the amount of neurogenous proliferation. Not infrequently the tumors grow as small submucosal nodules. The larger ones, either benign or malignant are quite distinctive and infiltrate the muscularis which is usually quite well preserved. When the tumor has extended through the serosa, adhesions between adjacent surfaces produce a knuckling or linking of the bowel which leads to obstruction. This is an important point in the differentiation of an argentaffinoma from a carcinoma; the latter instead of obstructing by linking the wall, narrows the lumen by constriction with annular growth. Secondary implants or metastases produce marked adhesions between serosal surfaces elsewhere.

The incidence of the small bowel tumors is less than one half that of carcinoids in the appendix. The former have a predilection for the terminal ileum, tend to cause obstruction and not infrequently metastasize. The majority of malignant tumors occurring in the appendix showed only extension or metastasis to the regional lymph nodes.

All argentaffinomas are potentially malignant. Their grade of malignancy, as a rule, is low. Treatment is surgical.

There is little doubt at present that the tumors arise from the Nicolas Kultschitzky cells in the gastrointestinal mucosa. The exact origin of the cells however is not at all clear. The evidence appears to be fairly well divided between the entodermal and ectodermal proponents. The function of the cells also remains a moot point. It is suggested that argentaffinomas found in obliterated appendices may be the result of proliferation of the argentaffine cells following chronic inflammation, while the tumors of extra appendiceal origin are true neoplasms.

JOSEPH A. NARAT, M.D.

Bruce G G. The Diagnosis and Treatment of Acute Appendicitis in Children. *Lancet* 1939 236 1247.

The author reviews a series of 467 cases of acute appendicitis operated upon by himself between 1925 and 1939. In this series there were 206 cases of appendicitis without gangrene, operated upon with out fatality, 114 cases of acute appendicitis with gangrene and without death, 76 cases with perfora

tion and local peritonitis or early abscess with 1 death 47 cases of perforated appendicitis with general peritonitis and 8 deaths and 24 cases of established appendicular abscess without death. This constitutes a total of 467 cases with 9 deaths (1.9 per cent). Of the 9 deaths 5 were due to general peritonitis 2 to pylophlebitis 1 to a secondary abdominal abscess and 1 to causes unknown.

The author differentiates between the description of the clinical onset of appendicitis as given by John B. Murphy in 1909 and that of acute obstructive appendicitis as described by Wilkie in 1931. He believes that repeated vomiting is an ominous symptom and often heralds impending gangrene and rupture of an obstructive appendix. In the entire series only 22 patients were under four years of age. Of these 15 were ill two or more days and all of the 15 cases were complicated by peritonitis or abscess. In this group the highest mortality rate was 15 per cent. The author advises very careful physical examination with very gentle palpation to determine the exact area of rigidity. He stresses that rigidity should be looked for before palpation for tenderness. Tenderness found on deep and rough palpation may be very misleading. He describes 5 definite clinical pictures according to the location of the appendix. The appendix may lie in the right iliac fossa lateral parallel to Poupart's ligament in the pelvis retrocecal or very high. The location of the rigidity as well as the maximum tenderness will depend upon the location of the appendix.

The author believes that operation should be done in all cases unless there is a definite palpable abscess. With such an abscess along the abdominal parietal wall or in the pouch of Douglas and with the rest of the abdomen soft and lax the Ochsner-Sherren treatment is indicated. The author does not believe that cases showing evidence of generalized peritoneal reaction should be treated conservatively. He states however that a profoundly ill and seemingly moribund child suffering from general peritonitis acidosis and extreme dehydration might be benefited by the intravenous administration of saline solution rest and warmth and by postponement of the operation for a few hours.

He uses nitrous oxide and oxygen anesthesia supplemented by novocaine infiltration. When a child is fully anesthetized he again palpates the abdomen for the presence of a mass previously undiscovered. He prefers a McBurney incision but by no means carries it out routinely. He believes that the appendix should always be removed under direct vision. If the appendix is gangrenous and adherent it should not be touched by the finger but the various strands of tissue which bind it down shall be divided with a knife or scissors. He usually inverts the appendiceal stump and has never seen any trouble therefrom. However when the cecum is very inflamed he permits ligation of the appendiceal stump to suffice. He believes that the abscesses should be drained carefully and that no attempt should be made to remove the appendix. However he waits

only two or three days for drainage of an abscess. Postoperative complications were few. There was only 1 residual abscess. This he believes was due to the fact that he drained the peritoneum in septic cases. This is in contrast to the results of Sworn who is skeptical of drainage and had residual abscesses in 53 per cent of his cases in 1937. Postoperatively the author uses heroin for pain and an indwelling catheter for distention and ample fluids by mouth. He decries the intravenous use of saline solution.

WILLIAM C. BECK, M.D.

Kelly, F. R. and Watkins, R. M. Appendicitis in Adults. *J. Am. Med. Ass.* 1939 112 1,85

The authors have analyzed another 1,000 cases of chronic acute simple and acute suppurative appendicitis in adults and compared the results with those obtained in their former series.

There is no great variance in the data for the two series except for the marked increase in the death rate of acute suppurative appendicitis. This rate has increased from 9 per cent in the first series to 23 per cent in the second. The reason for this increase in mortality can be explained by the delay in operation. There are three causes for this delay.

1. Changed economic conditions. The second series of cases occurred in the period from 1931 to 1936 and the patients were ill for four and nine tenths days. In the first series of cases which occurred from 1925 to 1930 the nation was in a prosperous condition. During depression years operation was delayed on the average of one and one tenth days longer.

2. Home treatment especially with laxatives. Because of the delay home remedies were often used and in the second series 42 per cent of the patients reported taking a laxative for their attack while in the first series only 24 per cent reported having done so.

3. Urinary abnormality. Genito urinary signs and symptoms may often obscure the picture of acute appendicitis delay operation and increase the mortality rate. Hematuria is the most important and was found to occur in 7.2 per cent of all cases and in 12 per cent of the acute suppurative type. The incidence of hematuria with acute retrocecal appendicitis was found to be 62 per cent. When the surgeon is confronted with hematuria in a patient suspected of having acute appendicitis he should not relax his vigil and wait. Rather it is his duty to conduct as prompt and thorough an investigation as the patient's condition permits (catheterized urine specimens a plain roentgenogram of the urinary tract and if time permits an intravenous pyelographic study).

The authors discuss their treatment of diffuse appendicular peritonitis. Although deferred operation has been urged in such cases the authors believe that comparatively few cases arise in which the question of deferred operation comes up.

Immediate operation is advised in (1) acute simple appendicitis (2) early suppurative appendicitis be

fore generalized peritonitis has developed (3) suppurative appendicitis with localized abscess, (4) general peritonitis associated with pregnancy, and (5) a doubtful diagnosis.

Drainage should be used in all cases of walled off abscess formation. If the appendix is readily accessible it should be removed, if not it should be left alone and drainage used. If the appendix is removed, and even though general peritonitis is present, drainage should not be used. The objections to drainage are:

- 1 It is impossible to drain the entire abdominal cavity.
- 2 The material used for drainage stimulates the formation of adhesions and increases the danger of intestinal obstruction.
- 3 A weakened incision with its accompanying direct hernia may result.
- 4 The hospital stay and expense are prolonged.
- 5 The mortality rate is definitely increased.

The authors suggest as a remedy to decrease the rate in the mortality rate the education of the public to avoid delay in seeking medical attention and prompt action on the part of the physician when indicated.

HARVEY S. ALLEN, M.D.

**Brunati J.** Anatomical and Clinical Considerations of Appendicitis (Quelques remarques anatomiques sur l'appendicite) *Rev. de chir.* Par 1939 58 313

In 254 of more than 500 patients operated upon for appendicitis Brunati made a special study in regard to the pathological findings and symptoms. In this group operation was performed in 274 per cent after peritonitis had developed in 27.45 per cent during the early stage of acute appendicitis in 1.91 per cent during a later stage of an acute attack in 9.40 per cent during the subacute stage, and in 58.56 per cent during the chronic stage. In the entire series the appendix was retrocecal in 9.44 per cent of the cases and latero external to the cecum in 9.44 per cent, in the group operated upon during the early acute stage it was retrocecal in 8.15 per cent and latero external to the cecum in 18.30 per cent, and in the group operated upon during the chronic stage, the appendix was retrocecal in 10.06 per cent.

Pathologically in 7.04 per cent of the cases of acute appendicitis the appendix showed, in addition to inflammatory changes, a gangrenous area without perforation, and in 8.45 per cent, gangrene with perforation in 25.35 per cent the appendix was more or less surrounded by adhesions. When the appendix was cut open it was found to contain pus or seropus in 56.33 per cent a serous exudate with congestion of the mucosa in 26.79 per cent a fecal calculus in 5.63 per cent a clot of blood in 4.22 per cent, and raisin seeds in 1.40 per cent. In 9.84 per cent of the cases of acute appendicitis the ileocecal region showed inflammatory lesions and in 4.22 per cent this lesion was more marked than the inflammation of the appendix itself. In another 2.82

per cent, there was no demonstrable lesion of the appendix but an acute inflammation of the ileocecal region (typhlitis). In 36.91 per cent of the cases of chronic appendicitis, the appendix was bound down by adhesions, in 16.91 per cent it was abnormally long, and in 13.65 per cent, it showed no definite lesions but there were bands and adhesions around the cecum and colon. In 2.01 per cent of the chronic cases, the appendix contained pus.

Of the cases diagnosed as acute appendicitis and operated upon within the first twenty-four hours of the onset of acute symptoms 74.08 per cent presented an appendix which was abnormally long, 1.40 per cent showed sclerosis of the appendix, and 2.80 per cent presented an appendix which was abnormally short. These are all findings that might be classed as chronic conditions. Ileocecal lesions were dominant in 4.22 per cent and lesions of the ileum in 1.40 per cent, with only slight inflammation of the appendix. In 2.82 per cent there was no lesion of the appendix, but typhlitis was present. This gives .672 per cent in which the pathological findings did not indicate a true acute lesion of the appendix. If one adds to the 18 per cent of cases in which the lesion was of the chronic type the 25.35 per cent in which the appendix although inflamed, was bound down by adhesions, there will be a total of 43.25 per cent with symptoms of acute appendicitis in which the actual lesion of the appendix was similar to that found in subacute and chronic cases. However in a number of these cases section of the appendix showed conditions to account for the acute symptoms—a foreign body, hemorrhagic lesions in the mucosa and the presence of pus. Even in the cases in which the ileocecal lesions were dominant the surgical removal of the appendix relieved the symptoms.

In the diagnosis of acute appendicitis the author has found a modification of Jacob's sign most useful, this is a pain on the right side occurring on sudden decompression of gas pressure in the colon on the left side. The location of the pain on the right side, carefully noted, indicates the position of the appendix. When the appendix is retrocecal, the tender spot is not at McBurney's point but in the iliac region near this point.

In the diagnosis of chronic appendicitis roentgenological examination is of value. The signs most characteristic of chronic appendicitis are spasm at or near the ileocecal junction, the presence of a painful area at or near this junction and retardation of the opaque medium at the ileocecal junction of frequent but not constant occurrence. The condition is most apt to occur in the presence of adhesions.

ALICE M. MEYERS

**Grieco F.** Mucocystic Appendix. A Clinical and Experimental Contribution (Appendice mucocistica. Contributo clinico e sperimentale) *Arch. ital. di chir.* 1939 55 504

Two predominant factors characterize mucocystic appendicular disease: the presence of a collection of

mucus in a section or in the entire lumen of the appendix and the preservation of the mucosa of the organ. Histologically the disease presents four types: mucous by drops of the appendix; myxoglobulosis; mucocoele of the appendix; and pseudomyxoma of the peritoneum of appendicular origin. Opinions are divided on the question of permeability of the appendiceal orifice. The symptoms of the various forms of the disease are not characteristic enough to allow pre-operative distinction between them; in general the diagnosis of chronic appendicitis leads to the intervention. The prognosis is better than that of appendicitis.

Grice describes a case in which the symptoms were those of typical appendicitis and the lumen of the appendix was found permeable cephalad and caudad to the central collection of mucus. Histological examination revealed more intense inflammation of the distal non-cystic part of the appendix and raised the suspicion of the presence of a terminal partial appendicitis which had probably originated after the appearance of the central mucocoele because the flora of the terminal part of the appendix had become more virulent. Complete obstruction of the lumen of the distal tract with consequent symptoms of acuteness may have been caused by the epiploic adipose cushion deriving anteromedially from the appendix. The rarity and interest of the case lie in the fact that a mucocystic section of the appendix with altered walls but with insignificant signs of inflammation continued distally into another section that presented a considerable degree of inflammation.

In order to determine the pathogenesis of these cases the author made a series of four experiments on rabbits.

In the first experiment he emptied the appendix by expression and ligated it at its base; in the second he used the technique of Calzolari and removed the central section of the appendix between two ligatures; in the third he followed the same technique after lavage of the appendicular lumen with Dakin's solution; and in the fourth he excluded the entire appendix or a part of it by means of a silk ligature following previous lavage of the lumen with sterile water.

The animals of the first two groups died from inflammation of the excluded organ. Two of the animals of the third group showed the formation of mucocoele; the others died of inflammation which may have been caused by the chemical action of the remaining Dakin's solution in the appendix. Nearly all the animals of the fourth group developed mucocoele.

Consequently the absence of the highly septic contents of the appendix due to preliminary lavage of the organ and the exclusion of the cecum may promote the formation of mucocystic appendicular disease characterized by a collection of mucus in the lumen of the organ and by the preservation and even the hypertrophy of the mucosa.

RICHARD KEMEL, M.D.

Donaldson J. K. and Thatcher H. S. Studies Regarding Silk and Catgut in Imagination of the Appendiceal Stump and Regarding Non-Invagination Technique. *Am J Surg* 1939 45 110

In a recent paper the authors discussed a series of experiments in which they compared the so-called ligation and drop method or non-invagination technique of appendectomy with the purse-string method. Silk was used for invaginating the appendiceal stump. In the present article they discuss further studies and compare a group of cases in which catgut was used for invagination.

One of the authors after having used the non-invagination technique or single ligation and drop method for eight years has returned to the use of the silk purse-string method. An analysis of experimental work upon three groups of animals (one in which the appendiceal stump was ligated and non-invaginated, one in which invagination was accomplished with silk purse-string sutures, and one in which catgut purse-string sutures were used) revealed the following facts: adhesions seemed to be less frequent and less extensive when the stumps were invaginated with silk purse-string sutures; they were a little more frequent when catgut purse-string sutures were employed; and most frequent when the appendiceal stumps were not invaginated.

Other complications appeared to arise more frequently in the cases in which catgut was utilized. The possibility should be considered that the catgut purse-string suture in the human being may be more likely to predispose to a higher incidence of abscess and fistula formation. The non-irritating quality of the fine silk when used in small amounts appears to be borne out by the clinical and experimental work of the various authors. The microscopic evidence when correlated with gross experimental findings in experiments in which the stump was invaginated with silk purse-string sutures indicates that the absorptive power of the peritoneum in the small pocket about the buried stump is sufficient to take care of an appendiceal stump which has been properly ligated, treated and invaginated with the proper type of black silk.

JOHN W. NUZZUM, M.D.

Lundgren A. T., Garstide E. and Boice W. A. The Conservative Treatment of Appendiceal Peritonitis. *Surgery* 1939 5 813

The original conception of the treatment of acute appendicitis was that of immediate operation regardless of the progress of the inflammation or the existence of complications. It is universally agreed that the appendix must be removed promptly when it becomes acutely inflamed in order that spread of infection beyond the appendiceal walls be prevented. Many patients with acute appendicitis are first seen by the surgeon after extension of the infection has occurred. It is in these cases of acute appendiceal peritonitis that conservative treatment is indicated.

The unfavorable results obtained by those who have endeavored to follow the conservative treat-

ment of appendiceal peritonitis can be attributed largely to a misunderstanding of the cardinal principles originally proposed by A. J. Ochsner, whose plan of treatment is based upon a correct evaluation of the reaction of the peritoneum to bacterial irritants. Ochsner reasoned that the natural protective reaction of the peritoneum could be further enhanced by directing treatment toward the inhibition of peristalsis in order to prevent the spread of infection. His original routine was absolute prohibition of any thing whatsoever by mouth, the employment of gastric lavage to combat distention of the intestine, the administration of retention enemas every three to four hours to carry on nutrition, the injection of morphine to relieve pain (and Ochsner thought also to retard peristalsis) and the administration of normal saline solution and glucose by proctoclysis to overcome dehydration. The patient is kept in the Fowler position, and absolute rest is essential. There should be no relaxation whatsoever in this treatment until the patient has been free from pain and fever for at least four days. It should be remembered that Ochsner recommended this regime only as a preparation for operation. He originally reported the cases of 1,000 patients thus treated in Augustana Hospital, Chicago, in whom the total mortality was 2.2 per cent.

The authors report a series of 3,771 cases from the same hospital including 303 personal cases. An analysis is given of the 303 cases. One hundred and seven patients all of whom survived had chronic or interval appendicitis. 143 patients had acute appendicitis which was treated by immediate operation; the remaining 52 patients were treated by delayed operation. The only deaths in this series occurred in patients with acute appendicitis. There were 4 deaths, the details of which are given, representing a mortality rate of 1.3 per cent for the authors' series.

Primary cecostomy is advocated in the cases of some of the more desperately ill patients in whom ileus is found to be present. In addition to the cardinal principles originally advocated by A. J. Ochsner, the authors use the Wangenstein duodenal suction for the relief of distention and ileus. Also, hydration of the patient is procured by intravenous and subcutaneous saline and glucose solution injections instead of by retention enemas and proctoclysis. The authors believe that the delay before operation can be slightly shortened by better methods of pre-operative preparation. They believe a further study of the conservative treatment of appendiceal peritonitis should be made. The results seem to justify the continuation of this type of management.

Daniels, E. A. The Precancerous Lesion of the Rectum and Sigmoid. *New Internat Clin* 1939 2: 140

The object of the author's presentation has been to emphasize the great and urgent need for recognition of the benign adenomatous lesion in the rectum and sigmoid. It is his firm belief that ultimately

such a benign condition will, in a large percentage of cases, become malignant. In his opinion, the adenocarcinoma of the rectum and sigmoid is preceded first by hyperplasia, then definite adenoma, and at a later period the adenocarcinoma develops. He makes the attempt to demonstrate the transition of the benign epithelial state into a malignant lesion by actual case histories. It becomes imperative that in the cases of all patients presenting themselves for examination, a thorough search must be made of the rectum and sigmoid for this benign lesion. Proctosigmoidoscopic examinations and barium enemas by the air technique are required, in order to recognize these benign lesions.

There is only one method of dealing with an area of hyperplasia, or with an adenoma in the rectum or sigmoid, and that is by diathermy, desiccation or coagulation through a proctoscope or sigmoidoscope. It is better to bring the patient back and do this procedure in stages rather than by too intense destruction of the tissue at one sitting. Ordinarily no anesthesia is required and the procedure is carried out in the knee chest or knee elbow position. A slight sedative may be required before starting and when the sphincters are tight and spastic it will be desirable to employ some type of local infiltration anesthesia of the anorectal musculature with a 1 per cent novocain solution or one of the oil soluble anesthetics. For adults the author never employs general anesthesia as a too thorough relaxation of the bowel would occur with crowding around the instrument. Moreover, the knee chest position is essential which neither spinal nor general anesthesia will permit. In children from whom co-operation cannot be expected general anesthesia or full basal anesthesia is recommended. One then employs either the right or left Syme position with the body thrown far forward and the shoulders down.

JOSEPH K. NARAT, M.D.

Dack, G. M., Kirsner, J. B., Dragstedt, L. R., and Johnson, R. A Study of Bacterium Necrophorum in Chronic Ulcerative Colitis and of the Effect of Sulfanilamide in the Treatment. *Am J Digest Dis* 1939 6: 303

The writers discuss the significance of bacterium necrophorum as the etiological agent in chronic ulcerative colitis. In a number of previous reports they were unable to reproduce the disease in experimental animals inoculated with these organisms but they found later that virulent strains of bacterium necrophorum produce a uniformly fatal infection in rabbits when injected subcutaneously. Sulfanilamide when properly administered was found to cure such infections. Treatment must be commenced on the third day; the lesions gradually regress and the organisms disappear. In view of this finding it appeared desirable to investigate the action of sulfanilamide in cases of chronic ulcerative colitis in man.

When the diseased colon is isolated from contamination by the fecal stream as by ileostomy,

aerobic organisms disappear from the colon discharges the flora becomes almost entirely anaerobic and the bacterium necrophorum predominates. The bacterium necrophorum has been found in the great majority of cases of typical ulcerative colitis when appropriate methods for its detection have been employed. It has not been found in the normal colon. Specific antibodies for it have been found in the blood of patients with chronic ulcerative colitis but not in the blood of normal individuals.

The bacterium necrophorum was not found in cultures taken at proctoscopic examination from the normal colon of 99 patients. It was present in 7 of 28 cases in which there was disease of the colon other than chronic ulcerative colitis. It was isolated from 27 of 38 patients in various stages of chronic ulcerative colitis. Ten of the 38 patients were treated in the acute stage of the disease with sulfamidamide. The sulfamidamide did not appear to hasten healing very markedly although mild to moderately severe cases showed slight improvement temporarily. On withdrawal of the drug there was a tendency toward exacerbation of the symptoms. In the rabbit experiments the infection could be cured with sulfamidamide but in the human being this bacterium did not disappear from the diseased colon of patients taking the drug. (After healing occurs the micro organism is usually absent.)

JOHN W. MIZUM, M.D.

**Goetze O.** Group Classification of Rectal Carcinoma in Relation to the Prognosis with Reference to Definitive Cure and to Operative Mortality. Types of Operation Which Are of Proved Value. (Die Gruppen-einteilung des Rectum-carcinoms fuer die Prognose der Dauerheilung und der operativen Mortalität. Bewährte Operationstypen). *Zentralblatt f. Chir.* 1939 p. 66.

For prognostic purposes the classification of carcinoma of the colon depends upon the degree of radicality of the various types of operation as well as their primary mortality. Any such classification must of course be effected with a certain amount of arbitrariness nevertheless. Goetze emphasizes the necessity of not losing sight of the individual patient in the many confusing possibilities in the use of general classifications. As is also evident from the newer works of the English and American literature (Rankin Miles) the operative treatment of cancer of the large bowel is also in need of classification. The excellent and terse discussion of the general problem, the relation of the seriousness of the operations employed, evaluations of the one stage and multiple stage methods and the technical description of the proved valuable types of operation as well as the consideration of practical selection of the operation proper for the individual patient must be read in the original article.

Goetze's plan of classification is of extreme importance for future experimental and clinical research. His groupings for operability are as follows:

1. Ideal cases permitting of any kind of operation even one stage procedures average about 10

per cent of the total material with an operative mortality up to 10 per cent.

2. Cases with sufficiently favorable conditions to allow of the typical two stage operations average 30 per cent of the total material with an operative mortality from 15 to 20 per cent.

3. Cases presenting grave conditions which require multiple stage procedures but appear to be radically operable average 20 per cent of the total material with an operative mortality as high as 40 per cent.

4. Advanced cases of carcinoma in which radical cure is possible only by daring operative skill and success is questionable average 10 per cent of the total material with an operative mortality of 60 per cent.

5. Cases with metastases at a distance but quite amenable to local radical surgery average about 20 per cent of the total material with an operative mortality of 40 per cent.

6. Cases which are definitively incurable and not even locally removable average 20 per cent of the total material with an operative mortality of 20 per cent for palliative procedures.

Following this classification is a discussion of the selection of the four chief types of operation subdividing them into three groups according to operability, the operation itself varying with the location and extent of the cancerous process: (1) one stage sacral amputation, (2) two stage sacral amputation, (3) two stage abdominosacral amputation and (4) multiple stage abdominosacral resection.

(HELVINGSEN) JOHN W. BRENNAN, M.D.

**Lahey F. H.** Carcinoma of the Colon and Rectum. *Ann. Surg.* 1939 110: 1.

The frequent origin of carcinoma of the colon and rectum in polyps and adenomas is an important fact and it is only through proctoscopic sigmoidoscopic and contrast barium enema examinations made on all patients complaining of the passage of blood by rectum that these lesions may be diagnosed early. In fact proctoscopic and sigmoidoscopic examinations should be a routine procedure of a complete examination. The fulguration of high polyps and adenomas is not without hazard and should be carried out in a hospital where emergencies such as hemorrhage can be taken care of immediately.

In a review of 300 cases of carcinoma of the right colon, left colon and rectum relative to their symptomatology Swinton found that 97.5 per cent had an alteration in some form of bowel function: constipation, diarrhea, alternating constipation and diarrhea, passage of blood or change in the caliber of the stool.

Up to three years ago the operability of carcinoma of the large bowel was 69 per cent up to one year ago this had increased to 72 per cent and during the past year the operability was 88 per cent. This is explained (1) by more complete routine examinations, (2) by the fact that many patients are referred to the clinic because of their operability.



The public (medical and lay) needs to be made aware that life with a colostomy in a patient cured of cancer is much more satisfactory than life with a palliative colostomy for inoperable carcinoma.

Lahey concludes with the statement that with an operability of 88 per cent the mortality is only 10 per cent. He re-emphasizes the fact that 47 per cent of the patients with carcinoma of the colon and 42 per cent of the patients with carcinoma of the rectum who have had a radical operation are alive and well more than five years without recurrence.

SIDNEY S. QUARRIE, M.D.

### LIVER GALL BLADDER PANCREAS AND SPLEEN

Ehnmark, E. Gall Stone Disease. *A Clinico-statistical Study*. *Acta chirurg Scand* 1939 Supp 57.

A very extensive review of the literature on cholelithiasis is presented together with a study of cases from the Acaademical Hospital autopsy material from the Pathological Institute in Uppsala and the record of deaths due to gall stone disease over a period of fourteen years obtained from the Central Statistical Bureau of Sweden.

This study was carried out in an effort to obtain an idea of the dangers associated with cholelithiasis. It is based on the results of operative and non-operative treatment, re-examination of the patients, a study of the different forms of the disease and the mortality during the subsequent course of the disease. This investigation was based on the cases of 1,061 patients with gall stone disease of whom 563 were operated upon and 498 were not operated upon during their first stay in the hospital. It was the author's conclusion that in a comparatively large number of cases this disease sooner or later leads to serious complications which considerably reduce the capacity for work and cause prolonged states of ill health or lead to fatal complications.

He found that the development of gall stones reaches its peak between the ages of thirty five and forty four in men and forty five and fifty four in women. The maximum risk for women is apparently at the age of fifty. The difference in the frequency of gall stones between the two sexes is shown by the incidence of 1.4 per cent in men between the ages of twenty and fifty and that of 8 per cent in women in the same age group. Beyond the age of fifty it is 9 per cent for men and 20.1 per cent for women.

The author found that the death rate for both men and women is approximately doubled each five year period beyond the age of thirty five. The risk is smaller for men than it is for women because of the fact that men contract gall stone disease less frequently than women. Between 50 and 60 per cent of all patients who develop gall stones are taken ill with gall bladder disease. The death rate for such patients up to the age of forty years is about 3 per cent. This is doubled to 6 per cent for those taken ill between the ages of forty and fifty and increases with the corresponding rise in age.

There were 498 patients with gall stone disease who were not operated upon during their first stay in the hospital. Among the 189 patients with non-complicated cholelithiasis there were no deaths. Of the 309 patients with acute cholelithiasis 20 died during their stay in the hospital. There were 120 patients not operated upon because it was their first attack or the attack was very mild. There were 68 who refused operation. In 50 advanced age or a poor general condition was a contraindication to operation. Obesity was given as a contraindication in 20, and diseases of the heart in 12.

However, 216 of the patients discharged from the hospital between the years 1922 and 1930 were re-examined. The author believes that for such a re-examination to be reliable it should be made at least five years or more after the operation as 10 per cent of the relapses do not occur until five years have elapsed. The average time between operation and re-examination among these patients was from six to nine years. Only 14 cases having been observed for a shorter period than five years. It was found that 28 of these 216 patients had died after their discharge from the hospital. 52.7 per cent were clinically free of symptoms, 9.7 per cent had mild discomfort and 37.6 per cent severe discomfort from their disease and 24.7 per cent of the total number had been operated upon later. In a review of these cases the author concluded that a relapse after one attack due to cholelithiasis whether combined with cholecystitis or not is considerably less severe than after several attacks. Furthermore the tendency toward recurrent symptoms after more than two attacks of gall stone disease is considerably greater than after one attack.

There were 620 patients operated upon for cholelithiasis between the years 1922 and 1935. Of these 261 were non-complicated cases, 5 of which terminated fatally after operation. There were 257 patients operated upon for acute cholecystitis with 27 deaths, a mortality of about 10.5 per cent. This mortality could be divided in two time periods, one between 1922 and 1931 when there was a mortality of 14 per cent in 121 cases, the other between 1932 and 1935 when the mortality was only 3.5 per cent in 86 cases. This decrease in mortality the author believes is due to a more conservative treatment of the disease and the postponement of surgery for a longer interval after the onset of the acute attack than was practiced in former years. There were 14 deaths in 102 patients operated upon for stone in the common bile duct. The mortality was high in the group of patients who had marked symptoms of common duct stone especially when associated with fever in contrast to those without fever and with less marked symptoms.

Of the patients who were re-examined 78.2 per cent were clinically free of symptoms, 14.1 per cent had mild discomfort and 7.7 per cent had severe symptoms. The percentages of patients who were clinically free of symptoms were as follows: 78.5 per cent of those with no complications, 80.7 per cent of



those with acute cholecystitis, and 34 per cent of 48 patients with common duct stones. The percentage of patients free of symptoms was higher among those who had had at most two attacks at the time of operation than among those who had had several attacks.

The author calculated the deaths to be between 25 and 50 per 100 000 men at the age of sixty, and a correspondingly higher figure for women. For men with calculi, the incidence of definite symptoms is between 20 and 40 per cent, and a similar figure was obtained for women. This indicates that less than half of the patients with cholelithiasis have morbid symptoms. He concludes that the risk of death for a patient ill with cholelithiasis stays at approximately from 3 to 6 per cent in younger people but rises to 20 or 30 per cent for the advanced in age.

In estimating the danger of cholelithiasis, the author concludes that in patients who have had at most two attacks, operation carries a mortality of from 1 to 2 per cent under the most favorable conditions, in this group operation decreases the risk of relapse from 25 per cent to 5 per cent. In patients having had more than two attacks the mortality after operation is from 1 to 2 per cent under favorable circumstances and higher for older individuals. The incidence of relapse in this group is greater and may be roughly estimated at 40 per cent.

ROBERT ZOLLINGER M D

Katsch G. The Diagnosis and Treatment of Pancreatitis (Diagnostik und Klinik der Pankreatitis). *Verhandl d. Gesellsch. f. Verdauungskrkh.* 1939 p 294.

Diagnosis of diseases of the pancreas has remained largely undeveloped even in clinics. This is shown by a questionnaire addressed to the German clinics. The number of diagnosed pancreatic diseases varied between 0.06 and 16.5 per thousand cases of all diseases. Even cases of acute pancreatitis were often unrecognized and confused with cardiac infarct, acute dilatation of the heart, arterioesophageal occlusion of the duodenum, and dynamic ileus. Between 1928 and 1937 499 cases of disease of the pancreas were observed at the Greifswald Clinic, 30 of which were carcinoma and 2 echinococcus disease. The author points out the significance of so called serous inflammation in the origin of pancreatitis. The pancreas has a particular tendency toward and aptitude for the formation of extensive serous edema which may lead to disturbances in the circulation of juices and to activation of ferments. The nomena of this sort may appear as a sequel to stasis of secretions in the pancreatic ducts, following diseases of the bile ducts and duodenum, in affections of the regional lymph glands and in ulcer of the stomach or duodenum.

Primary disease of the pancreas may arise from toxins carried to the blood stream to the course of infectious diseases such as diphtheria, dysentery, typhoid fever, scarlet fever, malaria, and mumps, and 10 toxic diseases produced by Gaertner's bacillus

in botulism and serum sickness. Diseases of the pancreas are often secondary to or complications of other diseases. The typical pancreatic pain in the left side, often radiating toward the heart, is mentioned as the most important symptom. A head zone of the eighth dorsal segment is frequently present. The pancreatic stool, indicating defective utilization of foods, is well known, occasionally fatty stools or diarrheas are observed. Additional symptoms are meteorism of the splenic flexure, glycosuria, or hypoglycemia, which are frequently to be interpreted as secondary to pancreatitis and not as indicating the presence of diabetes or adenoma of the pancreas. The development of icterus in primary pancreatic injury is brought about through swelling of the head of the gland and coagulation in the bile ducts and can give rise secondarily to gall stones. Finally, a palpable tumor of the pancreas should be included among the leading symptoms.

To confirm the diagnosis the following measures are recommended: (1) accentuation of the symptoms by provocation, (2) the employment of clinical measures for objective confirmation and (3) the production of fresh symptoms. The first provocative measure to be considered will be stimulation of the secretion, which is followed by pancreatic pain in a positive case. The best way to produce the stimulation is by the injection of from 2 to 3 c cm of ether through the duodenal tube; however, the fat meal affords a simpler method and provides at the same time the possibility of stool examination. A pathological blood sugar curve in the tolerance test indicates disease of the pancreas. Roentgen examination of the neighboring organs frequently establishes the presence of a non palpable tumor of the pancreas. Further meteorism of the splenic flexure atony of the stomach or duodenum, or infiltration of the duodenum is found occasionally. Pancreatic stools are also found. Investigation of the ferment content of the duodenal juice with drawn fractionally is important. Determination of the amylase content of the urine by Wohlgemuth's method has proved valuable as well as the determination of the serum lipase according to Rona, and that of the serum glycogenase according to Baltzer. The last named procedure has been carried out in from 600 to 7000 cases in the Greifswald clinic. In atrophy of the pancreas the glycogenase of the blood is lowered. In no case had an entirely healthy pancreas been attacked by necrosis; there had always been preceding injury and inflammation.

The important thing is to recognize mild forms of pancreatitis in the early stages and prevent catastrophe by suitable therapy. The anti diabetic protein fat diet is contraindicated. Lasting to the acute stage is the best treatment. The stomach should be emptied with the stomach tube intravenous injections of dextrose and strophanthin are recommended. Diseases of the pancreas belong to the internist. In nearly every case operation is of doubtful value and should be avoided.

(VAUBEL). FLORENCE A. CARPENTER

Cill W G and Mann W N Tuberculosis of the Spleen with Tuberculous Subphrenic Abscess  
*Brit J Surg* 1939 26 661

A review of the literature on tuberculosis of the spleen is given. It was found that the spleen is rarely the seat of disease responsible for subphrenic abscess. The authors were unable to find a previously reported case in which tuberculosis of the spleen was responsible for subphrenic abscess as found in their case.

Their patient a man twenty nine years of age first developed erythematous lesions about the elbows and ankles which became bullous and later pustular. All these lesions healed except one on the left shin. After several months during which time the patient had an elevation of temperature up to 103.8 degrees and a pulse rate of 130 the ulcer gradually healed. Within a short time he developed signs and symptoms of left subphrenic abscess which was drained. Despite adequate drainage the patient's condition became worse and he expired within eight months of the onset of his complaints. At the time of autopsy discrete yellowish areas in the liver were found which were very suggestive of tuberculosis. Of particular interest was the spleen which weighed 672 gm. Upon section there was practically no splenic tissue remaining except very small isolated pieces toward its lower pole. The splenic tissue had been replaced by a honeycomb yellow mass.

The clinical diagnosis of tuberculosis of the spleen obviously is quite difficult because of its rarity but the condition may be considered in the presence of an obscure splenomegaly associated with fever. Splenectomy offers the only hope of cure.

ROBERT ZOLLINGER M D

### MISCELLANEOUS

Siddons A H M and Power T D Swallowed Foreign Bodies  
*Proc Roy Soc Med Lond* 1939 32 385

From 3 London hospitals Siddons was able to collect 126 cases of patients who had swallowed foreign bodies. Among these cases there were only 3 perforations 2 of which passed unnoticed by the patient. There was 1 case of obstruction which ended fatally. The only other death occurred after removal of an open safety pin. In 107 patients or 85 per cent the foreign bodies passed naturally. Thirteen foreign bodies were removed because the surgeon considered it dangerous to leave them or because it did not appear that they would be passed naturally. Siddons divided his cases into three groups (1) blunt objects (2) long objects and (3) sharp objects. The average length of time for the foreign object to pass naturally in his series was

six days. In each group this figure was about the same. In no instance did a foreign body which was stationary cause damage except in the case of a rubber teat which was arrested in the ileocecal region and caused intestinal obstruction.

Of the 60 cases in which blunt foreign bodies were swallowed 8 were operated on for removal of the object. These operations were all performed within fifteen days of the object's being swallowed. Siddons believes that there are very few foreign bodies able to pass down the esophagus that will not pass through the entire alimentary tract provided that they are not sharp or unduly long. Given plenty of time only a few will stick, most of them will stop at the pylorus and if they pass the pylorus the ileocecal region seems to be the other likely site of arrest.

There were 18 cases in which long blunt objects had been swallowed. The longest was a bodkin 3 1/2 in long. These long foreign bodies usually pass the pylorus but find the fixed curves of the duodenum a difficult hazard. If they get past the fixed duodenal curves they usually find no other obstruction. Since the process of perforation with this type of foreign body is slow one can wait a week or ten days while the body is impacted. If it remains stationary for more than ten days it should be removed.

Forty eight patients had swallowed sharp objects. Of these 8 were admitted because of swallowing an open safety pin. There was no instance of perforation in the 40 other patients. Thirty seven patients passed the foreign body naturally and only 3 were operated on. Ifence Siddons believes that sharp as well as blunt foreign bodies should be given an opportunity to pass before operation is performed.

In the 8 cases of swallowed open safety pins 4 pins were removed by early operation with 1 death, 1 perforated the stomach wall and was removed safely and 3 were passed naturally. Siddons states that open safety pins are more likely to perforate than any other object commonly swallowed. However they like other sharp foreign bodies should be given a chance to pass naturally.

Power believes that there are 5 reasons for the swallowing of foreign bodies (1) entertainment (2) accident (3) ignorance (4) mischief and (5) suicide. Many of the entertainers are illusionists but a few doubtless swallow the objects. The swallowing of foreign bodies by accident is common. Infants or the insane swallow objects in ignorance. Often among the insane mischief is a frequent cause as they desire to give as much trouble as possible to those who look after them. It is only occasionally that a demented person tries to commit suicide by swallowing a foreign body.

FREDERIC W ILFELD M D

## GYNECOLOGY

### UTERUS

Wollner A. The Etiology and Treatment of Endocervicitis and Cervical Erosions. *Am J Obst & Gynec* 1939 37 947

From his observation of the histological effects of the ovarian hormones on the atrophic cervical mucosa in 6 patients the author believes that the following conclusions seem justified

Constant changes occurred which proved the participation of the ovarian hormones in the histological transformations of the cervical mucosa. Alterations resembling inflammatory conditions were produced by the administration of hormones. Specifically, estrin seemed to stimulate the proliferation of the columnar cell elements with hyperemic and edematous changes in the stroma. The administration of large doses of estrin changed the atrophic cervical mucosa into a structure which showed the typical picture of glandular hyperplasia with marked hyperemia, a condition commonly found in endocervicitis. Progesterin, on the other hand seemed to stimulate the growth of the squamous epithelial elements. The invasion of the endocervical surface by this epithelium was pronounced after the administration of progesterin. There is suggestive evidence that the combined action of estrin and progesterin alters the specific histological effects of the individual hormones. Progesterin seems to exert a certain inhibitory effect on the estrin action, while estrin seems to accentuate the stimulating effect of progesterin on the squamous epithelium.

Endocervicitis and erosion are chiefly characterized by an active proliferation of the columnar epithelium deep in the stroma in the form of a glandular hyperplasia and on the surface, by considerable folding of the covering columnar layer and an invasion of the portio surface. Such changes may be produced by an unopposed estrin action.

To ascertain whether histological pictures in the cervical mucosa, regarded as endocervicitis, can be influenced by the administration of progesterin, further studies were carried out. Three nulliparous patients between the ages of twenty five and thirty four were selected. All of these patients had a profuse cervical discharge with marked erosions otherwise they were normal. Cervical specimens taken from all 3 showed identical histological pictures. The administration of progesterin produced marked histological changes in the cervical mucosa. Also in all 3 patients a moderate decrease in the number of glands was noted. The hyperemic and edematous stroma changed into a dense structure and apparently the persistent progesterin action disturbed the normal course of the histological cycle since the secretory phase failed to develop at the expected time and the glands remained in the proliferative stage.

LEWIS L. CORNELL M.D.

White J W. Carcinoma of the Uterine Cervix. *Am J Surg* 1939, 45 4

Twenty per cent of women who die between the ages of forty five and sixty five die of cancer and of these one third die of carcinoma of the uterus, which in 90 per cent begins as carcinoma of the cervix. Two main factors are responsible for its development: an extrinsic factor of chronic irritation, a stimulant to cytogenesis, and an intrinsic factor of susceptibility. Erosions and circumoral cervicitis occur in 75 per cent of parous and 25 per cent of nulliparous women. Ninety seven per cent of the cases of carcinoma of the cervix develop in parous women and 3 per cent occur in nulliparous women with cervical erosions of infectious origin.

Histologically it is either epidermoid carcinoma or adenocarcinoma. Because of the mildness of the symptoms early stages are not seen. There are three forms frequently encountered which represent later stages of growth: (1) the most malignant form which gives rise to widespread infiltration of the surrounding tissue and quickly involves the lymph nodes; (2) a superficial fungating, projecting type which causes contact growth; and (3) the least common form a flat indurated ulcer of slow growth. White believes that in making the histological diagnosis the alterations in the epithelial cells proper are the deciding factor even though invasion is not present.

There are three routes of spread: (1) permeation of the connective tissue lymph spaces the principal source of spread; (2) metastases by way of the lymph vessels; and (3) metastases by way of the blood stream. It has been proved that the prognosis is dependent on the extent of the growth and that other considerations are less significant. When the diagnosis is made early a cure is possible in 50 per cent of the cases.

There are no pathognomonic symptoms but two suggestive signs: (1) unusual discharge and (2) intermenstrual bleeding. The early diagnosis rests on objective findings based mainly on inspection. The author considers the colposcopic examination and the iodine reaction of Schiller of academic interest. The latter test is based on the theory that normal vaginal and cervical epithelium contains glycogen which reacts with iodine to form a deep brown color. Areas of epithelium that deviate from the normal, such as carcinoma, hyperkeratosis and abrasions lose their glycogen and therefore remain unstained or assume a faint yellow color. Gram iodine is applied to the cleansed cervix and inspection is done one minute later. This test is a negative diagnostic method which directs attention to a lesion which should be submitted to histological study. The latter is the only precise method of diagnosis and should be done with a form of thermocautery knife to prevent diffusion of the carcinoma cells and bacteria and to control hemorrhage. Sections should be

taken under anesthesia and should include a portion beyond the margin of the growth.

Statistics indicate that carcinoma develops in cervical stumps in from 1.8 to 2 per cent of patients having had a supravaginal hysterectomy. However many agree that this is residual disease and since a greater number of patients will die from a complete hysterectomy than from a carcinoma of the cervical stump the admonition to perform panhysterectomies is not justifiable.

Of the forms of treatment irradiation efficiently administered is the safest and the most curative. Radical hysterectomy entails a mortality varying from 16 to 20 per cent and furthermore the disease usually is beyond these confines. In no other condition is radium more profoundly efficacious but it must be employed by experienced users. Insufficient dosage which cannot adequately sterilize the neoplasm renders it radioresistant and makes future safe irradiation difficult. The minimum total dosage of radium should be not less than 2,400 mgm. hr. and the maximum should not exceed 8,000 mgm. hr. The author employs the massive and continuous treatment. Deep roentgen therapy before radium application is advantageous as it affects malignant cells beyond the limit of radium, reduces the activity of cell proliferation, decreases the size of the primary tumor, controls hemorrhage and influences local infection unfavorably. After radium implantation high voltage roentgen therapy is essential.

The absolute curability rate of carcinoma of the cervix throughout the world varies between 20 and 30 per cent. The author's figures show that approximately 40 per cent of the patients died within the first year after radium treatment, 61 per cent of the total number of patients treated died within three years, 20 per cent lived five or more years and less than 6 per cent were alive after more than ten years.

EDMUND N. GOODMAN, M.D.

**Imbert L.** Cancer of the Cervix Uteri and Its Treatment (*Le cancer du col utérin son traitement actuel*). *Par de chir.* Par 1939 58 221.

The controversy that raged some years ago between the advocates of surgery and of radium as the treatment of choice for cancer of the cervix has subsided and the indications for each of these two forms of therapy have been more or less clearly defined in relation to the four stages of cervical cancer described by the League of Nations. There is a first stage in which the cancer is of very limited extent and does not trespass beyond the cervix; a second stage in which the neighboring tissues are involved including the parametrium and vagina but in which the mobility of the uterus is maintained; a third stage with more extensive involvement and limited or suppressed mobility of the uterus and probable invasion of the glands; and finally a fourth stage with massive infiltration of the parametrium, a fixed uterus and invasion of the bladder and rectum.

The author bases his personal observations on a series of 375 cases treated at the Anti Cancer Center

of Marseilles and under observation for a period of more than five years. Of 14 patients in the first stage 9 were cured and 5 died (65 per cent cures). Of 92 patients in the second stage 30 were cured and 62 died (32 per cent cures). Of 128 patients in the third stage 19 were cured and 109 died (14 per cent cures). Of 141 patients in the fourth stage 3 were cured and 138 died (2.5 per cent cures).

From his experience in this series the author concludes that in the first stage radium is definitely preferable to operation in the cases which are by far most common namely those in which the cancer is malpighian basal or spindle celled. However surgery is preferable for cancers of the cylindrical type which are quite rare. In intracervical malpighian cancers which are more common than the cylindrical one may try radium but should it fail radical hysterectomy should be done without delay for more than a few weeks. Hysterectomy should be done especially if the intracervical cancer belongs to the cylindrical type.

In the second and third stages the less advanced cases may be treated surgically but the operative mortality is high and definite cures are rare. Surgery is recommended only in cases of cylindrical cancer that are not far advanced. Otherwise radium is the method of choice. In the fourth stage that of desperate cases surgery would seem futile. However successes have been reported in some centers up to 2, 3, and 4 per cent but even in these cases radium is recommended the only contraindication being the presence of generalized foci.

EMILIE SCHAFFER MOORE

#### ADNEXAL AND PERIUTERINE CONDITIONS

**Haultain W. F. T.** The Treatment of Pyosalpinx. *J. Obst. & Gynaec. Brit. Emp.* 1939 46 503.

The treatment of acute and chronic pyosalpinx is discussed with special reference to the cases of 84 patients who were treated by the author in the past seven years. Of these 54 had acute and 30 had chronic pyosalpinx. Twenty-two patients were tuberculous. In all patients the fallopian tubes presumably pus filled were palpable on vaginal examination or true pyosalpinx was demonstrated at operation.

Of 54 patients with acute pyosalpinx 34 were treated conservatively. Of these 20 were cured (59 were eventually operated upon). There were 2 deaths both in the cases of patients with pulmonary tuberculosis. Conservative treatment included morphine and hot or cold applications for from three to four days followed by pelvic diathermy or short wave therapy for from three to four weeks. The latter was repeated if necessary.

The author believes that the treatment of acute pyosalpinx is not necessarily conservative as is the case with acute salpingitis. He agrees with Baldwin that operative interference should be undertaken if the function of the fallopian tubes is lost and when further retention will cause discomfort or probably

more serious consequences. Possible complications include persistent pain, menorrhagia and rupture of the tube. There were 4 cases of rupture and 2 cases of near rupture in this series.

Thirty patients with acute pyosalpinx were operated upon. These include the 10 patients who had received a full course of conservative treatment. There were 5 deaths. Three of these were due to peritonitis following rupture, 1 to peritonitis without gross rupture, and 1 to myocardial abscess.

The author believes that operation should be deferred if possible, until the sedimentation time (Linzermeier) is greater than one hour. Radical removal, to include the uterus, tubes and ovaries, is advised in most cases. If the ovaries are spared, persistent pain is likely to follow.

Drainage is advised (1) if the tube has ruptured, (2) if a large raw surface uncovered by peritoneum is left, and/or (3) if it is suspected that virulent organisms are still present, especially if the sedimentation time is less than one hour.

Those cases of pyosalpinx in patients without a history of a definite acute attack and without fever or an elevated pulse rate were considered chronic. Thirty such patients were operated upon, the majority of whom had received conservative treatment without marked benefit. There was 1 death from pulmonary embolism on the twenty third postoperative day. The other patients did well. The author believes that prolonged conservative treatment in these cases is not justified.

Twenty of 22 patients with tuberculous pyosalpinx were operated upon and radical operation was done on 13. In 6 patients the condition was acute. Death occurred in the case of 1 patient who had an associated gonococcal infection. The 2 patients who were not operated upon died of pulmonary tuberculosis. The 19 patients who survived made good operative recoveries. A follow up showed especially satisfactory results in the patients treated by radical operation. Three of the 7 who were conservatively operated upon had persistent pain. Menopausal symptoms were not prominent in the patients who had been treated by radical operation.

EDMUND N. GOODMAN, M.D.

### MISCELLANEOUS

Bloch, P. W. The Pathogenesis of Functional Menometrorrhagia in Adolescence (*Pathogénie des ménométrorragies fonctionnelles de l'adolescence*). *Gynec et obst.* 1939 40 5.

Bloch notes that functional uterine bleeding in adolescence is rarely sufficiently severe to require hospital treatment at the Maternity Hospital of Lausanne among 7,000 gynecological patients admitted in twelve years there were only 20 cases of menometrorrhagia of adolescence. In most of these cases the onset of menstruation occurred between the ages of twelve and sixteen years, the average age being fourteen years. The first severe hemorrhage did not occur at the time of the first menstrua-

tion in any of these cases, in 8 instances it occurred within the first year, and in the other cases not till more than a year after menstruation had begun. In most of these, however, there was some irregularity of the menstrual cycle from the beginning of puberty. Periods of amenorrhea were observed in 8 cases and 5 of the patients had dysmenorrhea.

In consideration of the possible etiological factors in these cases, the family history was found to be entirely negative in 14 cases, in 2 cases the mother of the patient had had similar functional bleeding until the time of her first pregnancy, in 2 cases there was tuberculosis in the family, although the patient had no signs of the disease, in 1 case, a sister was a deaf-mute and in 1 the father had tuberculosis and in 1 the mother was a diabetic.

In only 1 case was there definite evidence of uterine hypotonus and deficient contractility of the uterus. In 15 cases in which curettage was done, the endometrium showed glandulocystic hyperplasia, which is to be considered, not as the cause of the hemorrhage but as a sign of pituitary ovarian dysfunction. One of the patients showed a certain degree of masculinization with hypertrichosis, otherwise there was no other definite evidence of endocrine dysfunction other than the menstrual irregularities. The basal metabolism was determined in 4 of the patients, and in all was below normal, yet there were no clinical signs of myxedema. Examination of the blood or clinical symptoms showed some evidence of a hemorrhagic tendency in 8 cases, in 5 of these the blood platelets were diminished (from 125,000 to 189,000), in 1 case the bleeding time was greatly prolonged, and in 2 cases there was a tendency to ward the formation of petechiae or to bleeding on slight injury, and frequent nosebleeds. Most of the patients showed some degree of secondary anemia which is to be attributed to the uterine hemorrhages.

The characteristic finding in most cases of menometrorrhagia in adolescence appears to be the glandulocystic hyperplasia of the endometrium, and this is recognized as a sign of pituitary ovarian dysfunction with persistence of the follicle and hence excess production of folliculin and absence or deficiency of the corpus luteum hormone. It is probable, therefore, that the chief cause of the menometrorrhagia of adolescence is this endocrine dysfunction. Such an endocrine dysfunction would also involve some disturbance of the endocrine equilibrium and sympathetic nervous system function, which would explain some of the associated symptoms sometimes found in these cases.

ALICE M. MEYERS

Kreis, J. The Diagnosis and Treatment of Functional Menometrorrhagias of Adolescence (*Diagnostique et thérapeutique des ménométrorragies fonctionnelles de l'adolescence*). *Gynec et obst.* 1939 40 48.

Kreis is of the opinion that curettage with histological examination of the material obtained is absolutely essential for the correct diagnosis of functional uterine bleeding in adolescents as well as in older

women. Only in this manner can the pathological changes in the endometrium and thus the indications for treatment, be determined.

The author distinguishes three types of functional uterine bleeding: polymenorrhea or hypermenorrhea, intermenstrual bleeding and glandular hyperplasia with bleeding. The polymenorrhea of puberty is characterized by excessive and prolonged bleeding at the time of the normal menstruation. Histological examination shows minute necrotic areas and a delay in the regeneration of all the elements of the stroma in relation to the cyclic evolution of the glands. In the author's experience, he has found that this type of functional bleeding develops on the basis of congenital syphilis and is best treated by anti-syphilitic measures, preferably by Quinby's method.

In intermenstrual bleeding, the menstrual period occurs in a regular cycle, the bleeding may be normal in amount or may be excessive, but bleeding also occurs usually for a few days in the intermenstrual period between the eleventh and the nineteenth day of the cycle. In these cases, curettage shows necrosis of the stroma before the date of menstruation in the corpus luteum phase. In some of the patients there is an adolescent polymenorrhea, which retards the regeneration of the stroma, if the capacity for regeneration is entirely lost, the intermenstrual hemorrhage may become a continuous bleeding. In such cases, the anti-syphilitic treatment used for the polymenorrhea of puberty also controls the intermenstrual bleeding. In intermenstrual bleeding without associated polymenorrhea, various forms of treatment have been successful: medical treatment, transfusion, electrotherapy, and radium therapy (in small doses).

The third type of functional uterine bleeding in adolescence is that associated with glandular hyperplasia as described by Schroeder. This form of uterine bleeding is more difficult to treat than the other two types. Hormone therapy with corpus luteum and prolactin from pregnancy urine has been tried, but the results have been inconstant and unsatisfactory. In some cases, curettage controls the bleeding, when this and other methods fail, the author considers that hysterectomy without removal of the tubes or ovaries is the treatment of choice.

The ovaries should be left intact and any form of castration, partial, temporary or total, should be avoided.

ALICE M. MEYERS

Campbell R. E. and Sevrinhaus E. L. Pituitary Gonadotropic Extracts for Treatment of Amenorrhea, Menorrhagia and Sterility. *Am J Obst & Gynec* 1939 37 913

It is increasingly the authors' impression that the endocrine responsibility for amenorrhea, oligomenorrhea, menorrhagia, irregular cycles and sterility with anovulatory bleeding is to be considered pituitary hypofunction. The various clinical pictures mentioned are due to variations in the quantity of gonadotropic hormones liberated and to abnormalities in the timing of this secretion which determines the cyclic activity of the ovaries.

The onset of menstrual flow is the optimal time at which to begin the use of a gonadotropic factor when follicle stimulation is the objective. The therapy should be concentrated in the first fourteen days.

From an experience with the use of genuine pituitary gonadotropic extracts for seven years, the authors report examples of the results which may be expected in the treatment of women for primary or secondary amenorrhea, for menorrhagia and irregularity of the menstrual cycle and for relief of sterility. All the syndromes presented are considered to be the result of underactivity of ovarian hormones dependent presumably upon underactivity of the anterior pituitary gland in supplying gonadotropic hormones.

For accurate diagnoses and conduct of treatment, the use of endometrial biopsy and vaginal epithelial samples secured by pipette, as well as of pregnandiol determinations in the urine, are shown to be important aids. If these aids fail to show definite response to treatment, even though menstrual flows are occurring at fairly regular intervals, the treatment may well be increased or abandoned. The use of long series of repeated daily doses, extending from five to fifteen days at the beginning of each menstrual cycle, seems necessary and is demonstrated to be safe. Results are not achieved in a single month.

This study indicates the need for individualization of the dose and the preparation of more concentrated pituitary extracts.

EDWARD L. CORNELL, M.D.

Braine J. Genital Infarcts in Women (Ueber genital Infarkte bei Frauen). *Srpski Irch Lekarski* 1938 40 24

The author gives 2 case histories of genital infarcts in women. The first case was that of a twenty-year-old woman who some time previously had experienced a premature birth, apparently with puerperal infection. A macerated fetus of six months was aborted. The Wassermann test was negative. Two hours after delivery the patient complained of severe pains in the right iliac and lumbar regions, the pulse was 120 and the temperature 37°C. The patient was apprehensive and vomited. The uterus as well as the adnexa could not be defined because of abdominal rigidity and tenderness. Laparotomy was performed after eight hours. The right adnexa were swollen and blackish blue. The right infundibulopelvic ligament was blackish and as thick as a finger. With high ligation of this ligament a right salpingo-oophorectomy was done. The postoperative course was feverish but the patient recovered. The pathological report showed a typical picture of a hemorrhagic infarct.

The second case was an extensive hemorrhagic genital infarct in a twenty-one-year-old woman. She had a normal pregnancy for four months, then apparently pyelonephritis occurred in the fourth month and recurred in the sixth month. The course

of the delivery and of the puerperium was not given. The woman suddenly became sick with severe pain in the lower abdomen, fainting attacks, and vomiting. Her temperature was  $37.8^{\circ}\text{C}$  and her pulse 140. Laparotomy was performed about twelve hours after the attack. The uterus was bluish enlarged to the size of a two and one half months' pregnancy, and the ovaries were enlarged from six to eight times their normal size and of a light red color. There was a diffuse, subserous bloody edema of the entire pelvic peritoneum. Both infundibulopelvic ligaments were as thick as thumbs and the veins were thrombosed, the thrombi extending to the vena cava. There was bloody serous fluid in Douglas' pouch. A total hysterectomy was done. On the seventh day the patient died in uremic coma. Most likely a thrombosis of the vena cava and renal veins occurred. No peritoneal symptoms were present. Autopsy was not permitted.

Histologically the vessels of the uterus and adnexa showed numerous varicosities and rupture. There was a marked decidual reaction in the endometrium. The cause of the condition was obscure in both cases. It was probably an acute thrombophlebitis of puerperal origin. In the first case the maceration of the fetus may be considered the causative factor. In the second perhaps the retention of placental tissue or membranes which was not noted at parturition. Cases of genital infarcts from the literature were cited those of Herzheimer, Popoff, Chiari, Gueppert, Brackmann, Werbster, Danisch and Moulouguet, also those of Moure, Chastang and Fontaine, Mocquet and Benassy, Huet, Seneque, and Mongor-Lamy and Leroy. These cases include genital infarcts caused by alkaline necrosis of the uterine cavity following intra uterine soap and water douches used to produce abortion.

(VILMA JANISCH RAŠKOVIC) RONALD R. GREENE, M.D.

Mocquet P. Pelvic Abscess of Genital Origin Perforating into the Intestines (Les abcès pelviens d'origine genitale ouverts dans l'intestin). *Rev franç de gynéc et d'obst* 1939 34 273

Under the heading of pelvic abscess of genital origin the author includes 3 types of suppuration: (1) tubal and peritubal abscess (pyosalpinx), (2) suppurative pelvic peritonitis, and (3) pelvic phlegmons proper, phlegmons of the hypogastric tract which are common, and phlegmons of the broad ligament which are rare. However the origin of these abscesses and the type (whether they be acute or cold abscesses) have little bearing on the problems discussed. When cold abscesses associated with genital tuberculosis open into the intestine they are usually the site of secondary infection and therefore behave as acute abscesses.

Many years ago Delbet corrected the current opinion of that time that perforation into the intestine was to be considered the most favorable termination for pelvic suppurations in the female. Many such abscesses required surgical treatment in spite of or even because of such perforation. A cer-

tain number of them healed spontaneously within a short time but the remainder left permanent fistulas which exposed the patients to retention per foration into other viscera or chronic septicemia. Frequently an abscess which was believed to be cured recurred. In some cases the pus escaping through the rectum produced a severe rectitis with symptoms suggesting cancer. Pozzi states that an abscess opening into the rectum most frequently leads to fistula. It would thus seem safe not to count too much upon a favorable outcome even though this may take place occasionally. Also a cold abscess opening into the rectum may occasionally heal spontaneously. However, an abscess opening into the rectum followed by spontaneous healing does not always mean a cure. Persistence of adnexal inflammations will often demand operative removal, and the previous existence of an intestinal fistula may give rise to serious difficulties such as suture for intestinal perforation under difficult conditions and occasionally resection of the intestine or the formation of a postoperative intestinal fistula with or without fatal results.

One often hears the term 'perforation into the rectum'. Although according to Delbet the rectum is the most common site of perforation for salpingitis or abscess of the broad ligament, the author feels justified in stating on the basis of his experience, that perforation into the pelvic colon is almost as common. Such abscesses may perforate also into the cecum. Delbet has reported 2 such cases and the author describes a case in detail in which the site of the perforation was demonstrated by a barium enema. The indicated ileocolic anastomosis appeared to be too great a risk. Secondary hemorrhage greatly weakened the patient but was checked by tampons and hemostatics after which the patient recovered slowly. This case illustrates the importance of determination of the site of perforation, this is best accomplished by roentgenological examination following a barium enema. However a simple enema also may serve the purpose if the quantity of water injected is determined before its escape through the fistula. In some instances the time elapsing between the injection of carmine and the appearance of a red discoloration of the feces escaping through the fistula may prove useful in indicating the site of the fistula at least as to whether the small or large intestine is involved.

It might be suggested that prompt incision of an abscess would prevent perforation into the intestine. The author reports in detail 2 cases in which colpotomy did not prevent ulceration of the intestinal walls by the suppuration even though there was no operative injury of the intestine. Wharton is of the opinion that rubber drains favor the production of such fistulas. For abscesses opened by colpotomy the author uses a simple drain or a sheet of corrugated rubber.

In these abscesses opening into the intestine, one has to fear not only chronic infection but also secondary hemorrhage. In the author's second case

colpotomy was performed and intestinal derivation planned but the patient died from the effects of secondary hemorrhage before the operation could be performed.

Another case is described to demonstrate the value of colostomy in the treatment of pelvic abscesses opening into the intestine. After acute onset of the abscess this patient presented a chronic pelvic suppuration which failed to respond to repeated partial interventions. Total extirpation was impossible because of the condition of the abdominal wall and multiple persisting fistulas. There was a temporary vesical fistula following an operative injury to the bladder and a pyostercoral fistula following spontaneous opening of the abscess into the intestine. The general condition of the patient was poor and fever persisted until colostomy was performed. Then the fever subsided the suppuration diminished and a total extirpation could be done. In this case it was the intestinal derivation that cured the patient.

In chronic cases of this type with pelvic suppuration of long duration complicated by pyostercoral fistula a preliminary colostomy is indicated to render possible later extirpation. Such a colostomy should be made as high up as possible. In those rare cases in which the perforation occurs into the cecum or small intestine an exclusion by anastomosis is indicated. In acute cases indications are more difficult. Of the 3 patients in the present series all suffered secondary hemorrhage. 1 was cured. 1 is on the road to recovery and the third died before derivation could be done. In brief it may be stated that derivation is indicated if the general condition persists in being poor if the fever does not subside and if hemorrhage is threatening on the condition that the fistula is located in the pelvic colon or rectum and exclusion can be accomplished by colostomy. When the fistula is situated higher up exclusion is more difficult and the indication doubtful.

EDITH SCHANCE MOORE

Tausch M. Notes on Endometriosis Externa with Special Localization (Beitrag zur Endometriosis externa unter Berücksichtigung von Fällen mit besonderer Lokalisation). *Arch f Gynaek* 1939 168 8

The author reports 6 cases of rare localization of endometriosis among a total of 56 cases of endometriosis interna and externa observed in the University Women's Clinic in Tuebingen during the last ten years. According to the author the pathogenesis of the disease has been up to now uncertain. His observations lead him to believe that the lymphogenic theory of origin most probably applies to all the cases he reports. Three cases of umbilical endometriosis, 1 case of vaginal endometriosis, 1 of incisional endometriosis after appendectomy, and 1 case of endometriosis of the groin were reported.

In the first case that of a thirty seven year old para II there was black discoloration of the navel with bloody serous discharge for one year. Bilateral

cystic tumors of the adnexa were noted on vaginal examination. At laparotomy chocolate cysts of both ovaries were found. Resection of the tumors and excision of the umbilicus were done.

In the second case the thirty seven year old primipara had swelling of the navel for six weeks. Examination showed a dark pigmented nodule the size of a hazelnut in the umbilicus and a fibromyoma twice the size of a man's head. The fibromyomatous uterus was extirpated at laparotomy at the same time bilateral ovarian tumors partly intraligamentous were also removed. Extirpation of the umbilicus was also performed. Histological investigation showed in addition to the umbilical endometriosis an endometriosis of the left ovary.

In the third case several fibromyomas were enucleated five years earlier when the patient was thirty six years of age. Both ovaries which contained small cysts were partially resected. Present complaints of the patient were severe dysmenorrhea especially in the umbilical region and bleeding from the navel during the menses. Investigation revealed a fibroid twice the size of a child's head and a nodule the size of a hazelnut in the umbilicus. The uterus and adnexa were removed at laparotomy. The appendix was adherent to the genitalia and was removed with them. Histological examination revealed endometriosis of the posterior wall of the uterus the ovary appendix and umbilicus.

The fourth case was that of a thirty three year old sterile married woman who complained of severe dysmenorrhea. In the posterior vault of the vagina there was a swelling the size of a walnut around which were visible small vesicular elevations. In the left vaginal vault a nodular tumor the size of a small hen's egg could be felt. It was adherent to the vagina. Histological examination of the vaginal biopsy confirmed the presumptive diagnosis of an endometriosis. Some time later at laparotomy a wide spread endometriosis of the posterior uterine wall was found in addition to an extensive retrocervical endometriosis in the form of an extraperitoneal conglomerate tumor which was adherent to the rectum. The vaginal endometriosis was regarded as of secondary origin.

Case No. 5 was that of a thirty nine year old primipara who had had a laparotomy six years earlier because of secondary sterility. An ovarian cyst the size of a goose egg was removed from her left side and a *Doleris ventrofixation* was done. For two years the patient had observed a slowly increasing swelling in the right groin which became very painful during the menses. A tumor the size of a pigeon egg which lay in the region of the outer femoral ring and was adherent to the saphenous vein was extirpated. Histological examination showed areas of endometriosis in a lymph node.

In the last case a fifty one year old primipara in 1905 at twenty five years of age had an appendectomy with drainage through the right flank. In 1907 she had a breech delivery with a third degree tear and a urinary fistula. In 1921 a vaginal plastic



operation and repair of the fistula were done. For the past three years she had pain in the region of the appendectomy incision and during menstruation a bloody serous discharge from the thickened appendectomy scar. There was no hernia. Gynecological examination revealed a multinodular myomatous uterus as large as a man's head. No adhesions were found at laparotomy. The endometrial nodules were completely isolated in the scar and had no relation to the peritoneum.

(HUBER) RONALD R. GREENE M.D.

Morlicard R. and Saulnier F. The Development of the Genital Organs with Testosterone (Développement artificiel de l'appareil génital par les esters de testosterone) *Gynécologie* 1939 38 272

In addition to using the esterified male hormone in the treatment of the adiposogenital syndrome in children, the authors employed it to allay the neurosympathetic complaints of castrated women, such as hot flushes, asthenia, vertigo, insomnia, and impaired memory. They report many excellent results in an unspecified number of cases with the intramuscular injection of an average of 30 mgm per month. Testosterone is also credited with stopping the bleeding from a fibroid uterus, even though there was no change in the apparent size of the tumor.

E. S. BURGE M.D.

Cotté G. Martin J. F. and Mileff, Mme. The Action of Testosterone in Experimental Animals (Nouvelles recherches sur l'action de la testosterone sur le tractus genital de la lapine) *Gynécologie* 1939 38 257

The authors were interested not only in testing out the hormonal antagonism between progesterone or testosterone on the one hand and estradiol benzoate on the other but in trying to find some approximate numerical ratio of physiological effect between progesterone and the male hormone, testosterone propionate. Their criteria were the histological changes in the uterine horns and mammary glands of previously castrated immature female rabbits.

The 4 animals subjected to the experiment were injected on alternate days for two months as follows:

The first rabbit received a total of 30 mgm of estradiol benzoate, the second, 15 mgm of estradiol benzoate and 30 mgm of progesterone, the third, 15 mgm of estradiol benzoate and 75 mgm of testosterone propionate, and the fourth, 15 mgm of estradiol benzoate and 150 mgm of testosterone propionate.

From histological studies the authors concluded that in the castrated rabbit, milligram for milligram it takes more than 5 times and less than 10 times as much testosterone to neutralize or compensate for the effects of a given amount of estradiol. This they point out, correlates well with the ratio of 1 to 7 obtained by Zondek some time ago when he was working with these hormones in castrated animals, although he used changes in the hypophysis as his

criteria. They further conclude that testosterone propionate has a hormonal action similar to that of progesterone, but that to produce the same effects, one must use much greater amounts of the former, probably from 3 to 5 times as much as of the latter. They note that other authors, using the changes in the vaginal tract as a guide, have needed 40 times as much testosterone as progesterone.

They predict that as pure corpus luteum hormone becomes available in larger amounts at reasonable prices there will be much less use for testosterone in gynecological fields.

E. S. BURGE M.D.

Luisi G. M. The Sexual Hormones in Individuals with Fibromyoma of the Uterus and Their Pathogenetic Importance (Gli ormoni sessuali nelle portatrici di fibromioma dell'utero e loro importanza patogenetica) *Riv. ital. di ginec.* 1939 22 293

A quantitative or qualitative change in the ovarian secretion has long been suspected in the pathogenesis of fibromyoma of the uterus, but its nature has never been demonstrated. The influence of the ovary on the trophism of fibroma is evidenced by the fact that this neoplasm appears most frequently between the ages of thirty-five and forty years, develops only exceptionally before puberty and after the menopause tends to disappear after the latter and can be arrested in its growth by castration. Moreover, the influence of pregnancy and the puerperium on fibroma is significant. Also myoma is less frequent in the uterine neck, which responds less to ovarian activity than the uterine body. For the same reason the myoma in the uterine neck does not regress after the menopause. The nodular form of fibromyoma has been explained by the fact that real immature elements have been found in some cases, although in the physiological hyperplasias resulting from the influence of the ovarian hormones the mature cells behave as immature cells in their energetic growth. These elements probably respond more to endocrine stimulation and, being localized, give rise to nodular formations, the proliferation of which is stimulated during each utero-ovarian cycle. However, present knowledge warrants only the assertion that in fibromatosis there is a general endocrine disturbance in subjects with a constitutional and possibly also an acquired predisposition.

The concept of an endocrine disturbance led Luisi to determine the rate of estrogenic hormones present in the blood and in the urine over a twenty-four hour period and the daily urinary elimination of the gonadotropic hypophyseal hormones. He employed the usual techniques for this purpose and considered as estrus only the smears without leukocytes and with epithelial cells including nucleated ones. The total amount of extract was injected in two portions with an interval of eight hours, and the vaginal secretion was examined at least three times per day for four days. The experiments were conducted in 12 cases of fibroma and 8 controls.

In order to understand the results it is necessary to know that normally ovarian hormonuria presents one or two peaks, one is in evidence about the time of ovulation and the other (which may be absent) about the time of menstruation. Before and after the menstruation there is a drop, on the other hand hormonemia rises gradually from the end of menstruation to the day before its return. The tabulated estrone values found by the author are rather high, probably because of the technique employed but their main significance based essentially on a comparison between controls and fibroma carriers is not invalidated by that fact. There are no differences in absolute values between the two groups but the subjects with fibroma present a hormone content different from the usual one. In fact high and low values for hormonemia and hormonuria are found indifferently at various periods and the eurythmy of the hormonal rate seems to be a peculiar characteristic of each subject rather than the expression of a phase of the cycle. It was impossible to make more than one experiment in each patient but the irregularity of the results leads the author to think that in many of these subjects the menstrual hormonal cycle is altered so as to give rise to a continuous and rather uniform hormonal secretion. The determinations of the gonadotropic hormones have been so clearcut and constant that he thinks that individuals with fibroma present only a hypersecretion of prolactin A. In this connection he discusses the functional and anatomical changes in the gonads, hyperthyroidism, hemorrhage and sterility.

RICHARD KUEHL, M.D.

Bernstein P. Ectopic Pregnancy. A Diagnostic Problem in Gynecology. Report of a Case. *Arch Surg* 1939 38 864

The author describes a specific case of ectopic pregnancy because of its marked clinical atypical character and its representation of a small but important group of tubal pregnancies in which the Friedman test gives negative results. The diagnostic error is therefore high. About 20 per cent of women with ectopic pregnancy are reported as having given negative reactions to this test.

The principal unusual features were (1) normal menstruation each month during a two-month period of staining, (2) negative reactions to the Friedman test which was performed twice within an interval of two weeks, and (3) resting or proliferative endometrium obtained by curettage one week before menstruation during the episode of staining. Decidual reaction was not observed.

The only positive findings were a growing nontender mass, continuous staining, and a short episode of pain.

The inadequacy of the Friedman phenomenon in this type of tubal abortion was due to the complete detachment of the gestation mole from the tubal wall which effected a cessation in the production of the gonadotropic hormone, and accounted for its absence in the patient's urine. The test therefore gave negative results.

The author was unable to explain the proliferative or resting endometrium which was found in this patient one week before menstruation.

CHARLES BARON, M.D.

# OBSTETRICS

## PREGNANCY AND ITS COMPLICATIONS

Balard P Mahon R, and Broustet M P. The Interruption of Pregnancy in Cardiac Disease (L'interruption de la grossesse dans les cardiopathies) *Gynec et obst* 1939 39 466

Balard and his associates are of the opinion that cardiac disease is not an indication for the interruption of pregnancy as a rule, but in certain cases of severe or complicated cardiac disease, the interruption of pregnancy at an early stage is justified.

The most frequent type of cardiac disease found in pregnant women is rheumatic endocarditis, other types of heart disease are less common in the child bearing age. When a woman with cardiac disease becomes pregnant, a thorough examination should be made to determine the nature and severity of the cardiac lesion, this should include radiological and electrocardiographic examination as well as the usual clinical examination and tests of cardiac function. No single symptom can be regarded as an indication for the interruption of the pregnancy. If the history shows that definite cardiac insufficiency due to mitral stenosis was existing before the patient became pregnant and the examination shows the syndrome of decompensation with marked auricular dilatation, complete arrhythmia, cyanosis, aggravation of symptoms by any effort and the necessity for constant digitalization, immediate interruption of the pregnancy is indicated. Less severe cardiac disease is not an indication for immediate therapeutic abortion, but the patient must be kept under careful observation, and the preliminary examination will serve to establish the basis for the subsequent control of the case. During the course of pregnancy circumstances may arise which make an interruption of the pregnancy necessary. The authors do not consider that an acute cardiac attack is an indication for the interruption of pregnancy, under adequate medical control a pregnant patient recovers from such an attack without permanent damage to the heart. The chief indication for the interruption of pregnancy in the later stages in a cardiac patient is signs of progressive cardiac insufficiency in spite of adequate medical treatment. In such cases sterilization of the patient is also indicated whenever she is delivered by cesarean section, not usually otherwise.

If interruption of the pregnancy is necessary in the first three months, abortion may be performed by the usual procedures without ill effect on the cardiac condition. In the last three months interruption of pregnancy by the vaginal route usually involves a prolonged procedure that may seriously affect the heart. In these cases an abdominal operation (cesarean section) is preferable. Between these two periods, the choice of the method depends upon various factors—the stage of the pregnancy, the

condition of the cervix, and the patient whether she is a primipara or multipara. The fact that sterilization of the patient by the abdominal route is also desirable may influence the choice of method. Sterilization should be done by ligation of the tubes without interference with ovarian function. In most cases local anesthesia is to be preferred for the interruption of pregnancy in cardiac patients.

Alice M Meyers

Taylor H C Jr and Scadron E N. Hormone Factors in the Toxemias of Pregnancy. *Am J Obst & Gynec* 1939 37 963

In a broad sense there can be little doubt that the placental hormones are a factor in the late toxemias of pregnancy. The tests for these hormones give only approximate values. The blood and urinary figures for these substances show large normal variations between different individuals and even between different specimens of the same individual.

In a series of 21 cases of late toxemia and 17 cases of normal pregnancy, there was evidence of a frequent but not invariable lowering of the estrogen values in the toxemic cases and of an elevation of the prolactin values in a few cases only. A lowered pregnandiol excretion was also noted in a shorter series of determinations. No hormone abnormalities were noted in 8 cases of unexplained bleeding and 2 cases of premature separation of the placenta. The hormone changes observed in the toxemic patients are perhaps associated with the cause of toxemia, but may simply be the result of the disturbance of the kidney, liver, or placental physiology.

Edward L Cornell M D

Browne F J and Dodds G H. The Remote Prognosis of the Toxemias of Pregnancy Based on a Follow Up Study of 400 Patients in 589 Pregnancies for Periods Varying from Six Months to Twelve Years. *J Obst & Gynec Brit Emp* 1939 46 443

The authors point out that two important changes have taken place in current views regarding the sequelae of pregnancy toxemias. The first has been the emergence of the conception of recurrent toxemia. Kellogg defined recurrent toxemia as follows: "Recurrence in more than one pregnancy of some of the symptoms of toxemia of pregnancy in patients not definitely having chronic nephritis." It was Kellogg's suggestion that recurrent toxemia might be a manifestation of a faulty renal balance which allowed the patient to live without renal manifestation when not pregnant, but when the load of pregnancy was added caused her to develop renal insufficiency and thus reveal an otherwise concealed nephritis. The second change that has become manifest recently has been the increasing emphasis placed upon cardiovascular injury rather than upon chronic renal

damage as a sequel of pre-eclamptic toxemia and eclampsia. There has been very little concrete evidence that eclampsia causes chronic nephritis although it is believed that the toxemias may unmask a latent hypertension or aggravate a hypertension already established.

The material reviewed includes 400 patients observed in 589 pregnancies. The patients were seen in weeks three months six months and thereafter at intervals of one year after delivery. The examinations included the patient's general condition the state of the urine blood pressure heart and fundus oculi and, in some cases, estimations of the renal function, blood urea and urea concentration. The cases were classified as follows:

- 1 Pre-eclamptic toxemia 144 patients in 144 pregnancies
- 2 Eclampsia 46 patients in 48 pregnancies
- 3 Hypertension in which the hypertension was known to be present before pregnancy 65 patients in 86 pregnancies
- 4 Nephritic toxemia in which chronic parenchymatous nephritis existed before pregnancy 17 patients in 19 pregnancies
- 5 Recurrent toxemia 114 patients in 28 pregnancies

The residual lesion after pre-eclampsia was invariably hypertensive over 130/90 which resulted in 50.9 per cent of the patients. Chronic glomerular nephritis did not occur as a result of pre-eclampsia in any patient. For this and the other group various factors such as the height of the blood pressure during pregnancy age parity duration of illness and conditions on discharge from the hospital were correlated with the remote prognosis. For the pre-eclamptics the older the patient the greater her parity the higher the blood pressure during pregnancy and the longer the duration of the illness the greater seemed to be the liability to the ultimate occurrence of residual hypertension. Renal function test is of no prognostic value.

The residual lesion after eclampsia was also hypertension, which resulted in 60.8 per cent of the patients. Chronic glomerular nephritis did not occur in any patient as a result of eclampsia. The older the eclamptic patient the greater her parity the higher the blood pressure during pregnancy the longer the duration of illness before delivery and the greater the number of fits the greater seemed to be the danger of residual hypertension. The figures show that in this respect eclampsia was a more serious disease than pre-eclamptic toxemia.

Of the hypertensive patients 9.2 per cent were dead within the twelve year period. These were all patients with malignant hypertension who probably had, even apart from pregnancy, a short expectation of life. It is suggested that the majority of patients however who have simple hypertension pass through pregnancy without any demonstrable deterioration in their general condition.

There were only 17 patients in the series with chronic nephritis complicating pregnancy. The ultimate

prognosis was usually bad: 29.4 per cent of the 17 patients died within the twelve year period under review. While pregnancy is always a serious risk to these patients in about one half of the cases the patient did not seem to be any worse as a result of it.

In the group with recurrent toxemia 60 per cent of the patients had hypertension (above 130/90) in the interval between pregnancies. Many others had borderline pressures. The authors believe that these women are potential hypertensives and it is suggested that in all these patients there is a familial hypertensive tendency.

The authors believe that patients who develop residual hypertension after pre-eclampsia and eclampsia have a familial tendency to the disease which pregnancy has merely revealed. The pregnancy causes the hypertension to set in at an earlier period than it would have otherwise done.

DANIEL G. MORTON, M.D.

#### Gellé: The Treatment of Eclampsia with Convulsions (À propos du traitement de l'éclampsie convulsive). *Gynéc. et obst.* 1939 39 285

Gellé maintains that operative delivery is not indicated in eclampsia. The eclamptic patient is in a state of shock and one of the principles of surgery is to treat the shock first and operate afterward. This principle applies in obstetrics and operation is not indicated because of the eclampsia although it may be necessary on other obstetrical indications when the eclamptic convulsions are controlled.

A study of the blood chemistry in eclampsia shows an increased nitrogen retention (azotemia) hyperglycemia and acidosis with diminished alkaline reserve. The degree of these changes depends upon the number of convulsions that have occurred and the length of time that has elapsed since the onset of the eclampsia. It may be said, then, that they are the result rather than the cause of the eclampsia and the same is true of the lesions found in the liver and kidneys. There is one practical conclusion to be drawn from these findings since the cause of the eclampsia is not definitely known and that is that treatment should be directed primarily toward the control of the convulsions and of the nervous irritability; then it may be directed toward restoration of the normal blood chemistry and the function of the various vital organs the heart, liver and kidneys in particular.

For the control of the convulsions the author has found rectal calomel most effective. It is given per rectum in amounts generally used to obtain general anesthesia this dosage being diminished by 10 per cent if the patient is in coma or shows signs of cardiac insufficiency. The blood pressure must be carefully observed if there is a considerable fall in the blood pressure glucose solution must be given intravenously as well as a subcutaneous injection of from 10 to 20 units of insulin. After the convulsions are controlled the intravenous injection of hypertonic glucose solution (from 50 to 100 c.c.m.) and subcutaneous administration of insulin are indicated these pro-

cedures increase diuresis and diminish cerebral edema. Isotonic glucose solution may also be given subcutaneously with insulin, and cardiac tonics and calcium may be employed, as indicated. When the anesthetic effect of the rectanol wears off, it may be prolonged for twenty-four hours by the rectal instillation of chloral (1 gm.), or with morphine injections in small doses. If the convulsions recur after that time anesthesia may again be induced with rectanol. Given in ordinary doses, as for anesthesia, rectanol has no toxic effect on either the mother or the fetus. It has a definite hypotensive action and an anti-spasmodic as well as an anesthetic action. The author considers rectanol definitely superior to the drugs previously employed for the control of the convulsions in eclampsia. ALICE M. MEYERS

**Burger, K.** The Death of the Fetus Before and During Birth (Das Absterben der Frucht vor und während der Geburt) *Ortoskepes* 1938 28 7

The cases of death of children before and during birth are divided into two groups. In Group I the cause of the death was recognized and in Group II it was unknown. In Group I, aside from the element of birth trauma and disease of the mother and of the ovum, developmental and other disturbances played a rôle. Attention is called to the fact that birth trauma can cause the death not only of a fully ripened fetus, but also of an immature fetus. Under the group of diseases of the mother chronic nephritis as the cause of death of the child is thoroughly discussed. The significance of this disease with reference to pregnancy is usually not regarded with sufficient gravity. This is true perhaps because the differentiation of the toxemias of pregnancy not infrequently first becomes possible during the course of the post partum studies. In the material studied at the clinic, two thirds of the fetuses died in pregnancies which were complicated by chronic nephritis. The importance of toxemias of pregnancy with reference to premature births and death of the fetus is emphasized, in the material associated with toxemia studied at the clinic the number of premature births as well as the number of deaths was currently six times as great as in the cases of non-toxic pregnancy.

In the studies covering the fetal deaths arising from unknown causes the newer researches concerning the rôle of the hormones and vitamins during the course of pregnancy are discussed in detail. The fact is brought out that although the prospect of survival of the diabetic pregnant woman has been considerably improved since the introduction of insulin treatment the statistical results as far as the children are concerned are not favorable even today. The relationship of the thyroid gland to pregnancy and the results of animal experimentation are discussed. Thyroid gland preparations are recommended only for cases with a lowered basal metabolism.

The influence of the follicular and corpus luteum hormones on pregnancy animal experiments and

the use of these preparations in cases of habitual abortion are thoroughly discussed. The action of the follicular hormone in cases of underdeveloped uterine musculature is attributed to the strengthening of the latter, whereas the action of corpus luteum hormone is attributed to the diminution of the irritability of the uterus. With respect to the protective action of the corpus luteum the author presents the animal experiments which were carried out at his clinic, in which it was sought to carry the fertilized ovum by artificial means.

The action of the gonadotropic hormone upon pregnancy is discussed in detail, and the author's experiments upon pregnant dogs, in which he attempted to bring about death of the fetus by the administration of large doses of hormone, are mentioned. According to the experiences at the clinic, the determination of gonadotropic hormone in pregnant urine is suitable not only for establishing the diagnosis of pregnancy, but for diagnosing the death of the fetus in cases in which certain changes have taken place.

Vitamin research, which has in recent times become most popular, shows that the quality of the nourishment influences not only the development but also the life of the fetus. Vitamin A exerts an influence upon the fertility as well as upon the constitution of the pregnant woman and also upon the intra uterine development of the ovum. According to the results obtained in various animal experiments a deficiency of Vitamin B may lead to absorption of the ovum and to abortion; the unwarranted administration of Vitamin D during pregnancy is detrimental to the prognosis of labor, because it causes the fetal skull to lose some of its molding ability. A diet deficient in Vitamin C during pregnancy may lead to an interruption of the pregnancy or to the birth of offspring with arrested development. A deficiency in Vitamin E may cause sterility, a condition which may even be irreparable in the male animal. Since the diet during the winter months is poorer in vitamins it is to be expected that the average weight of children born in the spring will be below that of children born in the fall, a fact which was corroborated by the findings at this clinic. Not only the vitamins are of significance in the diet of the mother as it is well known in medical and veterinary circles that abortion may be produced by a diet poor in iodine and that the administration of iodine has a favorable influence upon habitual abortion.

Injuries of the ovum may lead to the death of the fetus *in utero*. The studies carried out by the author at the clinic showed that pregnancies which continued after threatened abortion very frequently ended in premature birth. Among the offspring of these pregnancies developmental defects were more frequently found and in later life more physical and mental deficiencies occurred than in the offspring of normal pregnancies. The union of hereditary recessive lethal genes may lead to the death of the fertilized egg before implantation has taken

place this has been proven by animal experimentation. The prolongation of pregnancy beyond term may also lead to death of the offspring. The author calls attention to the observation made at his clinic of the relationship between the duration of the menstrual cycle and the duration of pregnancy. Fetuses which came from women with a shorter menstrual cycle arrived at a certain length and weight in a shorter time than fetuses derived from women with a longer cycle.

The diagnosis of intra uterine death of the fetus is not always easy. The above mentioned changes in the pregnancy reaction and x ray examination may serve as aids in the establishment of this diagnosis. The blood coagulation time however cannot be evaluated according to the findings at the clinic. The diagnosis in most instances is not urgent since the dead fetus was expelled within one month in the greater portion of the cases observed at the clinic. Although the numerous experiments, investigations and findings which have been discussed have led in part to practical conclusions nevertheless as far as our present knowledge of the prophylaxis of intra uterine and subpartal death of the offspring is concerned our chief aids still remain the systemic examination of the pregnant woman and our obstetrical knowledge. The thorough execution of these examinations is not only a special medical but also a social problem.

(FELIX GAL) HARRY A. SALZMANN M.D.

### LABOR AND ITS COMPLICATIONS

Molz C. The Nature of the Pain of Labor. *J. Obst. & Gynec. Brit. Emp.* 1939 46 409.

Theories concerning the nature of visceral pain are considered. Considerable difference of opinion continues on this subject. The major point of variance is that while Lennander and Mackenzie emphatically state that pain cannot be experienced in a viscus. Hurst, Poulton and others believe that true visceral pain does exist apart from and in addition to a referred or projected sensation. They further believe that the apparent insensibility is due to the fact that the viscera will respond only to an appropriate stimulus which in the case of the gut and other hollow organs is muscle wall tension. If the referred or projected sensation doctrine is correct the possibility of relieving visceral pain by anesthesia of superficial structures comes up for discussion. However the efficacy of anesthetization of superficial structures for the relief of visceral pain has not been proved nor has the theoretical basis been clearly defined. This subject may be of importance to obstetricians for Theobald states that he has greatly relieved the pain of labor by infiltrating the ilio-inguinal, iliofemoral and pudendal nerves with a local anesthetic.

The uterus like other abdominal organs is insensitive to touch, pressure or cautery. On the other hand traction on the uterine supports or pressure of a clamp on the mesosalpinx will cause intolerable

pain. In contrast to the general insensitiveness of the uterus forcible dilatation of the cervix will always provoke severe pain both in the non pregnant and in the parturient woman. There is no conclusive evidence to show whether the pain of labor is a true visceral pain or a pain experienced in related somatic areas. It is possible that it is in part a referred sensation.

In the search for a method of testing uterine sensibility faradic stimulation was used. Both the cervix and the uterus of non pregnant parturient and puerperal women were tested. No sensation whatever was produced by the action of the faradic current.

The relations of a uterine contraction to the time of onset and duration of the pain experienced by the patient were investigated. The contractions were graphically recorded as waves of intra uterine pressure as registered by a small balloon inserted high in the uterus above the presenting part. The degree of pain was registered by the patient according to the rapidity with which she tightened and relaxed her grip on a little bag in her hand. The bag was connected to a tambour which registered on the moving drum directly above the uterine tracing.

It was found that there is a distinct lag in pain sensation. Pain starts some fifteen seconds after the onset of the contraction and remains unabated until the pressure is far on the wane. It was further demonstrated that the pain experienced by the patient is not necessarily proportional to the strength of the uterine contractions. These facts plus the fact that uterine contractions before labor are painless have influenced the author in his belief that the pain of labor is not directly due to muscle contraction but is caused by the stretching of the lower portion of the uterus and cervix. Stretching of the vagina and perineum is of course the main cause of pain in the late stage of labor.

DANIEL G. MORTON M.D.

### PUERPERIUM AND ITS COMPLICATIONS

Tisne Brousse L. A Consideration of Puerperal Septicemia Caused by Bacillus Perfringens (Consideraciones sobre la septicemia puerperal por bacilo perfringens). *Bol. Soc. chilena de obst. y ginec.* 1938 4 25.

Generally speaking publications on septicemias caused by bacillus perfringens are relatively rare and incomplete because of the rapidly fatal course which ensues in most cases. Nine cases seen at the Salvador Maternity Hospital in the course of a year and a half constitute the basis for the author's report. This figure could be readily augmented if the 4 cases reported by Matus and Sanhueza in 1936 and various incompletely worked up cases seen at the Asistencia Publica were added. From these figures it may be gathered that the incidence of puerperal septicemia due to bacillus perfringens is relatively high in Santiago. Because of the fulminating course of the disease however the reports published in the literature

ture do not represent its true incidence, as many individuals die before the diagnosis can be properly confirmed.

*Bacillus perfringens* is a frequent occupant of the vagina and intestine. No satisfactory explanation has as yet been found to account for the increase in virulence of this saprophyte which can take the life of a patient in a few days time. Some authors believe that hetero inoculation explains the greater incidence of this infection in criminal abortions than in normal births and spontaneous abortions. In this connection 8 of the author's 9 patients admitted the use of an intra uterine catheter which allows the elimination of the possibility of a single focus of origin in these cases. The fact that *perfringens* septicemia follows uterine infections more frequently than it does infections in other parts of the body is due probably to the extensiveness of the wound left by the separation of the placenta and the trauma to which the uterus is subjected during the induction of abortion.

In 35 per cent of their own post abortion cases which had a satisfactory course following curet tage the author isolated the *bacillus perfringens* from the products of conception. This is in accord with Franckel's belief that gangrenous infection during the puerperium appears in two forms in the first, the process is localized to the uterine contents and endometrium and the prognosis is favorable in the second, the process extends to the vessels, lymphatics, and musculature of the uterus and sets up a gas gangrene. It may reach the broad ligament and peritoneum and it gives rise to a septic condition.

The symptoms of septicemia usually commence a few hours after abortion and consist of violent chills fever, nausea and vomiting, diarrhea, melena, diffuse abdominal pain and asthenia. Subsequently the pulse rate increases to between 120 and 140 the temperature remains elevated or a hypothermia may supervene with a persistent tachycardia, low blood pressure and dyspnea. The latter is an early and constant symptom. Frequently a generalized cyanosis is present which is most noticeable on the face and nails. The tongue is dry. The secretions and products of conception eliminated through the genitalia vary in appearance from serosanguineous to putrid. The skin is pale or of an earthy bronze color and this together with the tachycardia (with or without fever), low blood pressure, dyspnea and marked alterations in the formed elements of the blood should suggest an anaerobic septicemia. Once suspected cultures of the blood, urine, and curettings should be taken without delay.

Shortly thereafter the symptoms typical of *perfringens* infection set in: the bronze color of the skin deepens to copper. Sometimes the latter is of a red dish hue approaching the color of a carrot or ripe pomegranate or it may be greenish blue. According to certain investigators this characteristic aspect of the syndrome is due to a pigment similar to the melanins. With respect to jaundice liver insufficiency

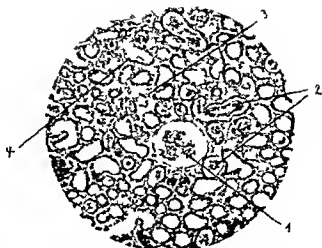


Fig 1. At 1 a normal glomerulus free of its capsule is seen at 4 atrophy of the renal epithelium, which is apparent in all tubules in focus. In part this atrophy is only apparent and represents regeneration. At 2 it can be seen that the contents of the lumina are composed of blood and pus. This can be verified with higher magnification. At 3 the stroma appears infiltrated by a diffuse inflammatory edema.

plays a minor role in comparison to that of hemolysis. The stools remain colored. The blood presents a laked appearance. The urine is thick and because of hemoglobinuria appears deep red, almost brown or black. At onset oliguria is present and within a few days the patient becomes practically anuric. In addition to hemoglobinuria, hematuria and albuminuria are also present. On microscopic examination pus epithelial cells and bacteria are found. *Perfringens* bacilli may be found among the latter. Urea and chlorides are low, urobilin is increased and bile salts and pigments are absent. While casts were not seen in the author's cases, at autopsy microscopic examination of the kidneys showed the tubules to be blocked by an extensive cylindruria.

The author attaches considerable importance to the early appearance of changes in the formed elements of the blood. A hyperchromic, microcytic anemia develops rapidly. Occasionally red counts as low as from 1,250,000 to 2,000,000 are seen on the second or third day of the illness. A polymorphonuclear leucocytosis of over 20,000 is usual. A characteristic feature is the fact that the degenerative changes seen in the neutrophils are more marked than in any other type of puerperal septicemia.

The importance of culture of the urine, blood, and products of conception when the slightest suspicion of this condition arises is stressed. The author points out that repeated cultures are often necessary and warns that if these tests are delayed until the full blown clinical picture appears the patient may die before adequate bacteriological confirmation of the diagnosis can be made.

The clinical picture thus far described is produced mainly by the hemolytic action of the *perfringens*.

toxin. This action may mask the effect of the myotoxins and neurotoxins present which can be recognized in the joint and muscle pains, cramps and hyperesthesia which accompany this condition. The necrosing toxins affect principally the liver and kidneys. Nitrogen retention increases rapidly, the bilirubin is elevated and there is a diminution in the alkaline reserve and total protein of the blood.

In the majority of acute cases the hemolytic icterus syndrome and parenchymatous changes especially of the hepatorenal variety are seen together. In patients with subacute cases who live from two to four weeks the hemolytic icterus is apt to be regressive and may give way to the hepatorenal picture which is manifested by somnolence, edema, asthenia, vomiting, diarrhea and Kussmaul's respiration and which terminates in death. Therefore there are said to be two phases in the course of perfringens septicemia: first the hemolytic icterus syndrome and second the hepatorenal syndrome. A characteristic finding at autopsy in these cases is the rapidity with which the bodies become distended with gas and give off a putrid odor.

In the differential diagnosis massive hemolysis produced by chemical abortifacients introduced into the uterine cavity (soap) should be kept in mind. Therapy should be directed at rapid extirpation of the infected focus and at neutralization of the circulating toxins. Curettage and hysterectomy were done about equally in the cases of 11 or 12 cures reported in the literature. Neutralization of the toxins should be attempted early with large doses of the specific anti-perfringens serum. Further therapy should attempt to control the concomitant marked humoral changes revealed by laboratory examination.

ROBERT H. E. ELLIOTT, JR., M.D.

#### Barr J. B. Remote Effects of Puerperal Sepsis *Brit. Med. J.* 1939 1: 1134

Barr studied 200 patients who had been hospitalized because of a verified puerperal sepsis with a view to analyzing the disability produced by this condition. All of the patients had been admitted from four to six years previous to the start of the investigation.

The examination consisted of a history of the condition of the patient prior to and after the sepsis, a general medical examination, pelvic examination, a bacteriological examination of the upper vaginal secretion, and a radiological examination when necessary. Barr personally examined all of the patients.

Seventy-seven (38.5 per cent) were sterile; contraceptive history was given by 33 of this group. In 25 per cent of the whole group no palpable lesion was found on pelvic examination; in 34 per cent chronic tubal disease was the chief cause, and in 36 per cent the outstanding lesion was chronic uterine infection.

The ratio of abortion to labor in the whole group was 1 to 5.7 before sepsis and 1 to 2.8 after sepsis. Chronic uterine sepsis was found to be the only causal factor.

The incidence of puerperal infection in the group with subsequent labor was comparatively high. This incidence was compared to the incidence in an unselected group provided by the medical officer of Glasgow.

The general health of the patients did not seem to be affected. This is explained by the fact that symptoms were mild even in the presence of definite pelvic lesions.

The total number of lesions found in this group of patients was 237 (chronic cervicitis 135, chronic corporal infection 58, chronic pelvic cellulitis 14, and chronic salpingo-oophoritis 30).

Extragenital sequelae were represented by the following conditions: persistent phlegmasia (21), chronic arthritis and rheumatism (11), recurrent tonsillitis (6), urticaria (2), chronic enteritis (2), and chronic endocarditis (2). There was no history of their existence prior to the puerperal infection.

In the majority of the patients the streptococcus hemolyticus was the infecting organism in the original illness, but in no case was this recovered from the genital tract in the follow-up.

CHESTER C. DOHERTY, M.D.

#### Morris T. J. A Preliminary Report on the Use of Sulfanilamide in Puerperal and Postabortal Infections *Am. J. Obst. & Gynec.* 1939 38: 67

In this study puerperal infection will be considered as an acute infection of the female genital organs producing an acute inflammation of the uterus or its surrounding structures, the peritoneum or the blood stream. Extragenital infections occurring in the puerperium were not included in this series. All patients treated were in the obstetric infection ward of Cook County Hospital, having been delivered in the hospital or elsewhere. Every case of morbidity with a temperature of 100.4° F. on two occasions or 101° F. on one occasion after the first twenty-four hours was included, and a similar temperature elevation was applied in the cases of postabortal infection. The modern accepted conservative treatment of puerperal infection was carried out in all cases and blood transfusions were freely resorted to when indicated. The patients treated with sulfanilamide were given this drug in addition to routine measures.

TABLE I.—MORTALITY IN PUERPERAL AND POSTABORTAL INFECTIONS

	Total cases	Deaths	Mortality per cent
Control			
Puerperal infection	55	1	
Postabortal infection	52	7	
	107	8	4
Sulfanilamide			
Puerperal infection	50	2	
Postabortal infection	47	1	
	97	3	3.09

To prevent certain toxic effects and serious consequences of the administration of this drug close



observation is necessary. It is not always easy to differentiate between the mild toxic symptoms of the drug and symptoms due to the infection. Cyanosis of varying degree is observed in a large number of patients undergoing intensive treatment. Immediate withdrawal of the drug in cases of anemia may be sufficient in mild cases. blood transfusion is satisfactory in severe cases.

Two patients from whom hemolytic streptococci were cultured while under control treatment died, in none of the patients who were treated with sulfamidamide and died were hemolytic streptococci found.

EDWARD L. CORNELL, M.D.

### MISCELLANEOUS

Winge, M. Quantitative Determination of the Gonadotropic Hormone of Urine in a Case of Hydatidiform Mole (Quantitative Bestimmung des Gehalts des Harns an gonadotropem Hormon nach einem Fall von Mola hydatidosa). *Acta obst et gynec Scand* 1939 19 186

A case of hydatidiform mole is reported in which determinations of the amount of gonadotropic hormone in the urine were made in a follow up study after removal of the mole. A virgin of nineteen was admitted to the Bispejaerg Hospital, Copenhagen, for vaginal bleeding and the escape of typical mole cysts. A mole that filled a small washbasin was removed at operation. This was followed by a continued bloody discharge and large soft masses were felt in both adnexæ (lutein cysts?). About four months later 9 000 rat units of gonadotropic hormone were found in a liter of urine, slight bleeding continued, and the adnexal masses diminished in size. About ten days later the bleeding ceased. About a week later the urine showed about 450 000 rat units of hormone per liter of urine. At the same time some vaginal bleeding recurred and the patient was re-admitted to the hospital because of a sus-

picion of the presence of a chorionepithelioma. Curettage revealed an acute endometritis, no signs of pregnancy or malignancy, and roentgenography of the lungs showed no tumor. One week later the urine showed 90 000 rat units of gonadotropic hormone per liter. One month later, the uterus and right ovary were somewhat enlarged, the left ovary was normal. The base of the vagina revealed some epithelial cysts without malignancy. This was followed by normal menstruation. About six weeks later the urine showed 10 rat units and three months after that 5 rat units of gonadotropic hormone per liter of urine.

According to the results of the hormone analysis and the clinical findings of persistent bleeding, enlarged uterus and ovarian cysts, the presence of a chorionepithelioma was possible, but the final result of the hormone analysis did not support this assumption. It is generally assumed that chorionepithelioma follows moles in 5 per cent of the cases and precedes it in 50 per cent of the cases.

Chorionepithelioma differs widely in its course from other types of malignant tumor: (1) it may grow rapidly, metastasize widely and end fatally in a very short time; (2) it may remain latent for a long time and then suddenly begin to grow as mentioned in (1); and (3) it may heal spontaneously. The question arises whether these different types of tumor express themselves in the hormone analysis of the urine. This has been proved in the case reported in which with the increased growth of the chorionic tissue the gonadotropic hormone of the urine increased and, with the cessation and disappearance of the growth, the hormone diminished to 10 and 5 rat units per liter. "Atypical results" of the hormone test in cases of hydatidiform mole and chorionepithelioma are reported in the literature, and in these cases the results of the test are exceedingly difficult to evaluate.

LOUIS NEUWELT, M.D.

# GENITO-URINARY SURGERY

## ADRENAL KIDNEY AND URETER

Broster L R The Surgery of the Adrenal Cortex  
*Brit J Surg* 1939 26 925

Cases of virilism may be divided into three main groups (1) prepuberal (primary amenorrhea) (2) postpuberal (secondary menstrual disturbances) and (3) postpuberal (associated with a polyglandular syndrome). The gradations of these groups are so smooth that it is difficult to imagine that they are due to different causes rather they represent a series of pictures due to modifications in one form of control which becomes disorderly in the earliest stages of fetal development. Crew states that the sex chromosome mechanism is the sex determining mechanism but under certain circumstances this may be overridden and the sex determined in other ways. It has been shown that the female embryo passes through an early and transient phase in which the cells of the adrenal cortex give a reaction similar to those of adult virilism which is associated with the presence of male hormone biochemically. Should this male phase in the female fetus be stronger than normal or be unduly prolonged then it may be expected to exert a marked effect on the rapidly growing and plastic embryo. The original genetic bias may be superseded or replaced by an abnormal endocrine one. The pituitary gland makes its appearance soon after the appearance of the male phase in the adrenal cortex and if this is abnormal then it acquires a defect which it continues to exercise in those functions which it subsequently controls. The adrenal cortex therefore plays the part of an accessory bisexual gland capable of secreting androgens and estrogens under control of the pituitary gland. Up to the time of puberty every individual is essentially bisexual becoming functionally monosexual only when the gonad is fully developed at puberty and tending to relapse into bisexuality again after the menopause or when the gonadal function ceases.

The technique of operations on the adrenal gland have been described by Crile Young and others. Technically the operation of unilateral adrenal ectomy may prove very difficult and unexpected bleeding deep down may be encountered. In prepuberal virilism the postoperative convalescence is stormy with a stage of marked tachycardia and excitability much resembling acute hyperthyroidism. Among 50 cases at Charing Cross Hospital there was 1 death due to pulmonary collapse and a persistent thymus.

The operation is performed in two stages first a preliminary laparotomy is performed in order to palpate which adrenal is the larger to corroborate the adrenogenital syndrome and exclude arrhenoblastoma and the possibility of adrenal rests. The

larger adrenal is removed about a fortnight later. The high kidney incision is now used for access the last rib being excised if small otherwise it is fractured at its neck. Suitable instruments designed for the operation are of great help. The procedure is comparatively safe but the two-stage operation has disadvantages. The majority of the postpuberal cases might be operated upon in one stage but an abdominal incision is a further respiratory embarrassment to a patient whose diaphragm has already been incised and whose pleura is liable to be accidentally punctured. To overcome these disadvantages Young has adopted a routine of bilateral exposure and removal of portions from each gland. This method enables both adrenals to be visualized but it does not make certain of a differential diagnosis such as arrhenoblastoma and must carry a certain risk of Addison's disease from bilateral thrombosis of the main adrenal vein. Pneumoroentgenography to show the size of the adrenals radiologically has been tried but this is said not to be entirely free from risk. Distortion of the renal pelvis by adrenal tumor as shown by urography must be a rare and late event and such a tumor will probably be detected by a plain x ray film. A useful guide in determining which adrenal to remove is to choose the gland on the same side as the larger and more cystic ovary.

In the prepuberal group there were 7 cases the earliest of which has not shown much change. Although there is still a considerable amount of bound hormone in her urine there is no further progress of the symptoms theoretically a hemi adrenalectomy of the remaining gland should bring improvement. A second case showed a reduction of free male hormone and menstruation began under hormonal treatment two years after operation.

When chosen with care the postpuberal cases are satisfactory for operation the physical disabilities are ameliorated and the psychical reaction improves. Operation deals more effectively with the facial hirsuties. A partial operation does not confer a total disappearance of all symptoms but it arrests their progress. Borderline cases present difficulty especially when operation is refused for the psychological reaction of the patient is sometimes worse than that in patients who may consider that operation has not come up to their expectations. The Capon test takes too long to be of any help in determining the need for operation and when it shows a very high urinary androgenic content the symptoms are obvious as well. The new color test which can be performed from a twenty four hours collection of urine may prove helpful in deciding which of this group of cases should be operated upon and it is being investigated at the present time from this point of view.

LOUIS NEUWELT M D

Smith H W New Aspects of Renal Physiology  
J Urol 1939 41 867

A comprehensive review of newer aspects of renal physiology is presented by the author, in which clearance methods and the part that these methods take in medical and urological problems are described. The clearance methods described afford a means of measuring the filtration rate, the renal blood flow and the total mass of tubular excretory tissue in the normal human kidney. These methods have also revealed that the filtration rate and the renal blood flow can vary independently within certain limits and that the action of drugs and other therapeutic measures upon the renal circulation can be observed.

In so far as the clearance methods have been applied to the diseased kidney they have revealed marked disturbances of the renal circulation which would not have been suspected from the use of previous methods and the author expresses confidence that even though they present certain technical difficulties a further application of these methods to medical and urological problems will be well rewarded.

D E MURRAY MD

Contini V A Contribution to the Study of Renal Ectopia (Contributo allo studio delle ectopie renali) Arch ital di chir 1939 55 430

Contini states that renal ectopia is usually unilateral, is found more frequently in women than in men, and is often associated with other congenital anomalies. The pelvic type is the most infrequent but also the most important form because it comes into contact with abdominal organs, vessels, nerves and bones in which it may cause various changes and disturbances and because its clinical diagnosis is very difficult. The kidney is nearly always smaller than normal and often deformed; its ureter issues from the renal pelvis at a right angle and the position of the renal arteries and veins offers great possibilities for compression and even obstruction of the ureter. The symptoms of ectopic kidney are rather variable and usually due to intercurrent pathological factors or compression of the neighboring structures. In cases of respiratory or digestive disease accompanied by loss of weight, pain may occur in the presence of a healthy ectopic kidney probably because of relative mobility of this organ which causes traction on the neighboring tissues. Hematuria and calculous hydronephrosis have been observed.

The possibility of the presence of ectopic kidney must be kept in mind when palpation of the abdomen discloses a reniform tumor smaller than the normal kidney with irregular or lobulated contour of hard elastic consistency, painless or slightly sensitive and fixed or only slightly mobile. Perception of the pulsation of a large artery on the anterior aspect of the tumor or in a depression in which the pressure of the finger causes the desire to urinate and absence of the kidney from its usual site are important diagnostic signs. Gynecological and rectal examinations disclose the typical tumor against the sacrum.

An ectopic kidney must be differentiated from a moving kidney, cystoscopy with ureteral catheterization, ascending and descending pyelography, separate examination of the urines of the two ureters, and chromocystography clear up the diagnosis. The diagnosis of ectopic kidney is facilitated when a pathological process involves the organ such as chronic inflammatory, tumoral, calculous or tuberculous hydronephrosis and pyonephrosis.

There are two opinions concerning surgical treatment: one favors conservative treatment whenever possible, the other radical. According to the first, a diseased ectopic kidney should never be removed before the integrity of the other kidney has been ascertained. According to the second, any spontaneously painful, calculous or hypoplastic and functionally defective ectopic kidney should be removed.

Five cases are described in all of them the pain originated at the site of the ectopia. The first and fifth cases presented the symptoms of appendicitis; in the second and third cases more or less typical symptoms raised the suspicion of ectopic kidney and the fourth case simulated disease of the urinary passages. The first 3 patients accepted intervention; 1 was operated upon transperitoneally with a para-rectal incision; in the 2 others the extraperitoneal route was used. Recovery was uneventful.

RICHARD KEMEL MD

Sacco E The Diagnosis of Hydronephrosis Due to Anomalous Vessels (Sul problema diagnostico delle idronefrosi da vasi anomali) Ann ital di chir 1939 18 351

The author presents the detailed records of 10 cases of hydronephrosis due to anomalous vessels as observed during the past five years at the Surgical Clinic of Genoa. All authors are agreed that anomalous vessels may cause hydronephrosis but differ on how this condition is brought about. When Ray and Rokitsanski in 1841 reported the first cases of hydronephrosis due to anomalous vessels three theories were invoked to explain the pathogenesis: the mechanical theory, the congenital theory and the dynamic theory.

The mechanical theory maintained that the pressure of the anomalous vessel on the ureter prevented the free flow of urine from the pelvis. Such compression caused a valve or kink in the ureter which aggravated the retention. To do this the vessel must come in intimate contact with the ureter as occurs in renal ptosis or rotation.

The congenital theory considers the anomalous vessels of secondary importance. This theory claims that congenital malformation of the ureter and its anomalous insertion into the pelvis of the kidney is the chief cause of the hydronephrosis.

The third or dynamic theory ascribes the development of the hydronephrosis to a primary disturbance in the pyelo-ureteral peristalsis. According to this theory the anomalous renal vessels cause an inhibition or arrest of normal contractility in the ureter.

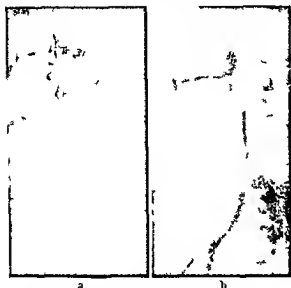


Fig 1 a Ascending pyelograph (horizontal) in erect position

The problem of the pathogenesis of hydronephrosis with anomalous vessels offers some questions which still require a precise solution. The author finds that his cases are best explained by the mechanical theory.

In all of his cases the author found some degree of renal ptosis and in all the anomalous vessel caused a compression or kinking where it crossed the ureter. In these cases he also observed a dilatation above the compressed area and a normal caliber of the ureter below this level. The compressing vessel seemed to act as the chief factor in causing the retention in the renal pelvis.

In the diagnosis age and sex do not seem to be of any particular value. In the majority of the cases the first symptom was pain which in most cases was severe and occurred intermittently. The pain was rarely continuous. It was localized in the lumbar regions and the superior abdominal quadrants with radiation into the inguinal region as occurs in renal colic. In some cases the pain is reflected to the contralateral kidney. The pain is aggravated in the erect position and diminished in the horizontal position. In the author's cases the pain dominated the clinical symptoms. There is a tendency for the renal crises to occur with greater frequency until they occur almost daily in untreated patients. This slow progressive aggravation of the pain without any other noteworthy symptoms is the most characteristic clinical manifestation.

During the crises of pain reflex gastro intestinal disturbances occur with nausea and vomiting. The urinary tract reacts with an oliguria during the colic followed by a polyuria when the pain subsides. There may be a mild tenesmus of the bladder which ceases when the pain stops. Naturally when an infection is superadded the symptoms of a hydropy-

nephrosis occur. There is high fever, anorexia and malaise, the general health is affected, the urine is turbid and the signs of cystitis persist even in the intervals of the attacks.

Palpation will indicate the size and the degree of mobility of the kidney. In all the author's patients the kidney was more or less clearly palpable by bimanual examination. In the majority the viscera exhibited a greater mobility than normal.

Simple radiography is important for elimination of the possibility of a calculus. The finding of a renal calculus does not necessarily exclude the possibility of anomalous vessels. Endoscopic examination gives indispensable information as to renal function. Chromocystoscopy gives a rapid indication as to the relative function of the two kidneys. This may also offer an indication as to the occurrence of a bilateral vascular anomaly. The elimination of the indigo carmine was found to be proportional to the severity of the hydronephrosis found at operation.

There is no direct method for the demonstration of an anomalous vessel which obstructs the urinary passages. Pyeloscopy offers the ideal method for this purpose. Simple pyelography gives an easy photographic method of determining all the details. Retrograde pyelography may also be of great help. The pelvic cavity is more or less dilated. The extrarenal part of the pelvis assumes a globular shape while the calyces preserve their normal appearance (Fig 1). With increasing distention the calyces also distend and enter into communication with the pelvic cavity.

Blanc and Bourland have stated that a dilated renal pelvis with an intact ureter speaks for an anomalous renal vessel. Radiography in both erect and reclining positions is of great help in the establishment of the diagnosis (Fig 1).

The author presents a series of instructive radiographs and a bibliography of the subject.

JACOB E. KLEIN, M.D.

Vergoz and Lenck. Anterior Perinephritic Abscess (Du phlegmon périnephrétique antérieur). *J. d'urologie et chir.* 1939 47 369.

At the Thirteenth Surgical Congress Lejars called attention to anterior localization of perinephritic abscess which is rare. Since that occasion the authors have found 19 such cases reported in the literature. The condition is of interest because of the difficulties of diagnosis and the problem of proper incision and drainage. In this article the authors consider only the metastatic type of phlegmon with anterior localization which develops in the course of infectious disease or some slight medical or surgical condition. The usual frequency of posterior localization is due to the posterior distribution of the perirenal fat. Perinephritic abscess may occur after small pox, typhoid fever, scarlatina, septicemic gonorrhea and such local cutaneous or subcutaneous infections as furunculosis.

Anterior localization occurs most frequently on the right side (in 12 of 16 cases). It may be in front

of the superior pole (3 cases), and of the inferior pole (1 case), in front of the hilus (2 cases) or it may occupy the anterior face of the kidney (4 cases). In cases with voluminous collections of pus it may occur in the iliac region. In general the pus has averaged from 100 to 250 gm. When present in large amounts the pus may invade the surrounding regions and descend behind the peritoneum into the iliac regions. In the surrounding areas there is usually found a presuppurative edema. The parietal peritoneum over this region reacts by an inflammatory thickening. At laparotomy even if the abdominal organs are normal an edema is apparent in the parietocolic gutter with a gelatinous appearance underlying the posterior peritoneum. The kidney usually shows changes, because cortical abscess is the intermediate stage between the septicemic phase and the perinephric phlegmon. The peritoneum reacts to the inflammation with adhesions to neighboring organs; thus there are interhepatic, renocolic adhesions or inter splenic adhesions with subphrenic inflammatory tumors, which cause great difficulties in diagnosis. Such an encysted accumulation of pus may secondarily rupture into the peritoneal cavity, with resultant general peritonitis. These collections of pus are frequently surrounded by false membranes which may be very confusing to the orientation of the operator. Couvelaire has therefore insisted that in peritonitis of doubtful origin a minute examination be made of the posterior peritoneum.

The onset may be sudden and dramatic, or insidious with localized pain; the temperature may show extreme fluctuations or there may be an even temperature with a rapid pulse. In short the syndrome is that of a general infection with local changes. However the most characteristic symptom of anterior perinephritis is deep diffuse pain in the hypochondrium; this does not present the definite lumbar localization of the posterior perinephritis; the pain is deep more abdominal than lumbar and poorly localized and suggests a hepatic or splenic localization. The pain may cease with periods of calm; there may be paroxysms of pain at irregular intervals; the costolumbar angle may be painful on palpation or there may be intense pain on palpation over the gall bladder region which may falsely lead to a diagnosis of disease in that organ. The pain is frequently associated with vomiting, and there may be intestinal paresis with distention, a peritoneal syndrome provoked by irritation of the posterior parietal peritoneum. In general the symptoms are more abdominal or pleurodiaphragmatic than renal or lumbar.

The diagnosis of this condition is difficult. The most common error is the diagnosis of appendicitis. Usually the pain is too low for gall bladder and too high for appendiceal involvement. There is a history of furunculosis or a similar source of infection. All other acute infections of the kidney must be excluded by study of the urine and pyelography. X-ray examination is a definite aid; it showed the disappearance of the renal silhouette and of the edge

of the psoas in 9 of 10 cases, lumbar scoliosis with the concavity on the affected side and immobility of the dome of the diaphragm. Roentgenography and pyelography are considered important aids in the diagnosis.

The treatment of anterior perinephritic abscess consists of incision and drainage with care to protect the general peritoneal cavity from entrance of the infection. When the diagnosis is made the best approach is the paraperitoneal transverse anterior incision of Bazy.

From their own experience and from the literature the authors present the detailed clinical records of 16 cases of this condition.

Anterior localization of perinephritic abscess should be more widely known in order that the differential diagnosis of infections in the hypochondrium can be made and the fatal complication of rupture into the abdominal cavity with general peritonitis be avoided.

JACOB E. KLEIN, M.D.

#### Hamm F. C. and DeVeer J. A. Fatty Replacement Following Renal Atrophy or Destruction. So Called Lipomatosis of the Kidney. *J. Urol.* 1939 41 350

Fatty replacement of the kidney, heretofore cited as a rare entity, is in the opinion of the authors neither a clinical nor a pathological entity, but rather a common and unimportant accompaniment of renal atrophy and destruction. Reviews of the literature have disclosed 47 cases of replacement lipomatosis, but it is believed that only the more advanced cases have been considered true examples and worthy of being reported. Such markedly advanced cases will of necessity be encountered less frequently than the milder types, but the authors believe that both are representations of the same process and vary only in degree.

Six illustrative cases are presented, they depict mild, moderate and advanced grades of the condition. In 5 cases stone and infection were present but the lesion is also found in non-inflammatory conditions such as senile atrophy and arteriosclerotic contracted kidney. Findings not ordinarily encountered by the urological surgeon in clinical practice. In addition a case of marked fatty replacement in a case of tuberculosis of the kidney with extensive parenchymal destruction is cited from the literature.

It is contended that fatty replacement is not peculiar to the kidney—a similar process occurs in other organs undergoing atrophy. Accordingly, the authors believe that designations connoting a neoplastic invasive or destructive process should be discarded for one that clearly indicates the secondary nature of the process. In addition, it should be used only to amplify the description of the pathological lesion to which it is secondary. Of the many descriptive terms suggested the most appropriate would seem to be 'fatty replacement' as for example, in pyelonephritis with renal atrophy and fatty replacement.

ARTHUR H. MICHURIS, M.D.

**Fernandez M. Oxalic Acid Metabolism in Renal Surgery** (Il metabolismo dell'acido ossalico nella chirurgia del rene) *Arch Ital di uol* 1939 16 166

Fernandez reviews the work accomplished in the study of oxalic acid metabolism in renal surgery.

Exogenous sources of oxalic acid are chiefly spinach, beans, chocolate, potatoes, dried figs or the sugars as acted upon by certain bacteria in the intestinal tract. A high carbohydrate diet is found to produce oxaluria and oxalemia. Other oxalogenic substances are the purines. That there are also endogenous sources of oxalic acid is suggested by the fact that fasting causes no appreciable alteration in the blood level, which on the other hand is raised by the intravenous administration of glucose and depressed by inulin. The close relationship with sugar metabolism is therefore evident. Part of the oxalic acid in the body is eliminated mostly by means of the kidneys, although it is suggested that the intestine as well as the biliary tract and the salivary glands are also instrumental. The remainder of the oxalic acid is destroyed by the erythrocytes of the blood stream, the hepatic cells, and secondarily probably by the kidneys.

Three categories of pathology have been established: disturbances of retention, decalcification, and elimination. In the first are included certain articular syndromes, nervous disorders, and types of dermatitis; in the second the vagotonias and spasmophilias; and in the third hematuria, calculi, and other urinary tract disturbances and liver disease.

Since the kidney is the main portal of elimination for the substance under discussion, Fernandez performed various operations on rabbits and tabulated his results in terms of the oxalic acid level in the blood and the oxalolytic power in the blood. In individual variations in these values in normal animals were found to be great. Nephrotomies resulted in changes not exceeding the normal in range. Nephrectomy caused a transitory elevation of the blood oxalic acid level with a slight but appreciable depression in the oxalolytic power. Stripping of the renal capsule followed by sympathectomy of the renal artery resulted in an increase in the oxalolytic power. The author attributes the negative results in the nephrotomy cases to the minor trauma involved in the operation, the elevation in blood oxalic acid level after nephrectomy is interpreted as being related to the temporary damage to the liver. The increase in the blood oxalolytic power following stripping of the capsule with sympathectomy of the renal artery is accounted for hypothetically on a basis of neurohormonal disturbances.

EDITH FARNSWORTH M.D.

**Morison D. M. Routes of Absorption in Total Ureteral Obstruction** *Arch Surg* 1939 38 1108

In a previous paper the author presented experiments demonstrating lymphatic and tubular absorption of molecular dyes and colloidal preparations in the presence of hydronephrosis. During the course of these experiments there was no evidence of

absorption into the general system. The author therefore decided to continue his investigations with other agents and to observe whenever it was possible the actual process of absorption in the living tissues.

A short resume of the two main operative procedures is presented. The author concludes that there is a rapid absorption from a totally obstructed hydronephrotic sac into the general circulation of such agents as neo-iodipax and phenolsulfonphthalein. Indigo carmine is similarly eliminated but more slowly. Interruption of the lymphatic vessels at the renal pedicle produces no appreciable effect on the rate of absorption, which would seem to indicate an exclusively venous route. Rapid lymphatic absorption follows the intertubular injection of dyes into the superficial aspects of the cortex. Studies of the ureter and the renal pelvis suggested that absorption from the walls and lumen is relatively slow. Tubular absorption of the dyes from the pelvis is usually manifested in about thirty minutes but can occur more rapidly in the case of obstruction of from four to five days. With longer periods of obstruction an hour or more may elapse before the dye is evident at the cortex.

In several instances of obstruction of from five to eight days standing, evidence was obtained that suggested that the varying pelvic pressure occasioned by peristaltic movements is transmitted directly by fluid continuity from the pelvis to the distant convoluted tubules in the superficial zones of the cortex.

DOVE E. McLEARY M.D.

## BLADDER URETHRA AND PENIS

**Darget R. and Lange J. Results of the Treatment of Cancer of the Bladder by Implantation of Radium Needles in the Open Bladder in a One Stage Operation** (Résultats du traitement des cancers de la vessie par l'implantation d'aiguilles de radium à vessie ouverte en un temps) *J. d'ur.* med. et chir. 1939 47 273

The method employed by Darget and Lange for the treatment of tumors of the bladder by the implantation of radium needles in the open bladder was described by Lange in his thesis in 1935 (Bordeaux Thesis). The technique involves careful protection from the action of the radium of the involved portions of the bladder.

Sixty cases of tumor of the bladder, excluding all papillomas with a narrow pedicle and all tumors not clinically malignant, have been treated by this method. In all but 8 cases histological examination was made and the tumor proved to be malignant in these 8 cases the malignancy was clinically evident. The tumors treated included sessile tumor and papillary tumors with a large base but not those with a true pedicle, also infiltrating tumors with infiltration of varying degrees, including those with ulceration of the bladder wall.

Of the entire group of 60 patients, 30 are now living. There were 2 deaths following the operation.

1 from cardiac failure and 1 due to intestinal paralysis, 6 other patients died within three months, 4 from azotemia and 2 from metastases. Of 32 patients treated more than five years ago 11 are living without recurrence, 14 were cured, as 3 patients died from intercurrent disease without recurrence more than five years after treatment this gives a percentage of 43.8 for five year cures with 35 per cent of the patients still living. Of 53 patients treated more than eighteen months previously (up to 1937), 23 are living without recurrence, 6 other patients died more than two and one half years after treatment without signs of recurrence. In 38 of these 53 patients the tumor was infiltrating of these, 20 are living. Of the patients treated more than five years previous to the report 17 had infiltrating tumors, 6 of these are living and 1 other was cured but died of intercurrent disease more than five years after treatment a rate for five year cure of 41.2 per cent. Of the 52 patients in whom histological examination proved malignancy of the tumor 28 are living. Twenty five of the 52 were treated more than five years previously, of these 9 are living and 10 were cured 1 dying of intercurrent disease thus the percentage of five year cures was 40. Of the entire group of 52 cases with proved malignancy 33 showed infiltrating tumors of this group 19 patients are living in 13 of them treatment was completed more than five years ago and of these 13 patients, 5 are living and free from recurrence a five year cure percentage of 38.5.

These results the authors maintain are better than those obtained with other methods of treatment. In careful follow up studies of their patients including cystoscopic examination the bladder has been found to heal completely sometimes within six months sometimes only after a longer period up to one year. The bladder capacity has rarely been reduced. To obtain these results the technique originally described must be carefully followed.

ALICE M MEYERS

Shih H E Melanoma of the Urethra *Am J Cancer* 1939 36 243

Malignant tumors of the urethra are very uncommon and only 9 cases of melanoma have been recorded in the literature.

A single case of the disease is reported. It was treated by partial amputation of the penis and is free from recurrence and metastasis two years following the completion of the operation.

Urinary symptoms are not constant but tumor dysuria lateral deviation of the urinary stream and a foul or bloody discharge may be the principal symptoms in either sex. Externally obstruction of the urinary stream becomes the main clinical feature. The differential diagnosis must be made from syphilis and epithelioma. Histologically the melanoma is composed of compact masses of irregular polygonal or large spindle cells with clumps of brown pigmented granules in the crevices of the tissue as well as in the tumor cells.

When a metastatic lesion, regional or distant, is present, a positive diagnosis may be made by excision and examination of one of the lymph nodes.

ELMER HESS M D

## GENITAL ORGANS

**Demis R** The Treatment of Urinary Retention of Prostatic Origin by Endo Urethral Resection of the Prostate (Traitement de la rétention d'urine d'origine prostatique par la résection endo urétrale de la prostate) *J d urol med et chir* 1939 47 395

Since 1934 the author has treated all cases of operable prostatic retention by endo urethral resection regardless of the volume of the prostate or the age of the patient. The series includes 103 patients with an intact bladder and 35 with an opened bladder.

Among the 103 patients with the bladder intact, 85 had complete retention and 18 had dysuria with a retention of more than 50 c cm. Fifty per cent of these patients were between sixty and seventy years of age, the average age of the entire group being sixty eight years. Eighteen of the patients were febrile, but with the indwelling catheter the temperature became normal between the fifteenth and twenty first days. Only those patients were operated upon who passed more than 15 gm of urea in twenty four hours. Almost all the patients were operated upon only after having had an indwelling catheter for several days (eight days on the average). This accustoms the patient to a catheter and also lowers the blood urea. The patient was operated upon only when he was afebrile. Sixty six operations were completed at one sitting 39 patients had to have two resections and 4 had three. The residual urine after treatment usually fell to less than 50 c cm when the patient was discharged from the hospital. The average period of hospitalization was twenty one days, with a minimum of twelve days and a maximum of sixty four days.

Among the complications were pyelonephritis hemorrhage and 1 case of septicemia. When the operation is complicated by hemorrhage it is necessary to wash out the bladder thoroughly and free it from blood clots. Orchitis may also appear as a complication.

There were 35 patients who because of fever a narrow urethra, or the failure of other methods, were not suitable for endo-urethral resection and were subjected to cystostomy. In these the bladder was closed on an average of six days after resection. It should be remembered that cystostomy is a serious procedure with possibilities of thrombosis and embolism, and should be done only in suitable cases.

The causes of death and failure were infection resulting from a latent unrecognized pyelonephritis (1 case) uremia (1 case) and septicemia after resection with the bladder closed (1 case in which the patient had not had previous drainage by catheter). As to the 2 failures 1 patient could not be treated by resection because of fever, and the other had scarring of the canal from a previous attempt at resection.

A study of the results reveals the following facts:

In all 140 cases were treated. In 105 with a closed bladder there was 1 death and 1 failure. In 35 with an opened bladder there were 2 deaths and 2 failures. In the entire series there was a total mortality of 2.14 per cent and 3 failures. Eight patients had a mild incontinence, 10 patients returned with complaints. Of the latter 1 had pyuria, 2 had hematuria, 3 had neoplasms, 2 had residual urine of more than 80 c cm, and 1 developed dysuria ten months after operation. In general the results of transurethral resection may be considered excellent.

The author discusses in detail the technique of resection in the different types of prostatic enlargement. It is suggested that all tissues removed be studied histologically. In this way the author discovered 8 cancers in his group of 140 cases. With a successful first operation recurrence are most rare. As adjuvant treatment in controlling further growth and recurrence he recommends a ray and hormone therapy.

The author is satisfied with the results offered by endo urethral resection of the prostate; the results depend a great deal on the perseverance and technical skill displayed by the operator. From the patient's standpoint the operation is desirable because of the low risk of the procedure.

JACOB E. KLEIN, M.D.

**Denis R. and Dufour P. Endo Urethral Treatment of Urinary Retention Caused by Cancer of the Prostate (Traitement par voie endo urétrale de la rétention d'urine occasionnée par cancer de la prostate). J. d'ur. méd. et chir. 1939 47 410**

Among a series of 140 resections, 17 were for cancer of the prostate. In 1936 the authors operated by endo urethral resection upon a patient with a supposed adenoma of the prostate. The unexpectedly good results in this instance (which turned out to be a case of cancer of the prostate) led to other efforts in this field. Since this experience every prostate treated has been examined for cancer regardless of the clinical appearance.

The first 4 cases of cancer are described as follows:

The first was that of a sixty-nine year old man who was treated by endo urethral resection plus roentgen therapy. He has lived for thirty-one months and is apparently cured.

The second patient was seventy years old and was treated by endo urethral resection without roentgen therapy. He enjoyed twenty months of apparent cure. Roentgen therapy has been given for the past five months; the urine is clear without cystostomy.

The third patient was sixty years old and was treated by endo urethral resection and for twelve months showed apparent cure, then a high prostaticectomy was performed and up to the present time a period of sixteen months the patient has enjoyed apparent cure without roentgen therapy.

The fourth patient was subjected to an endo urethral resection with apparent cure for eighteen months. Dysuria has set in since that time.

Since 1937 there have been 13 more such cases without a death.

It is important to watch the bladder capacity because endo urethral resection is inadvisable if the base of the bladder has been infiltrated so as to diminish the bladder capacity considerably. Spinal anesthesia is contraindicated because the sensitivity of the bladder and the abdomen must be maintained.

In the authors' series no metastases were observed after endo urethral resection. The authors do not believe that roentgen therapy favors metastases. Furthermore, roentgen therapy considerably influences the volume of a number of prostatic tumors. The authors favor strong deep doses of radiation in early mild cases and endo urethral resection followed by irradiation in characteristic severe cases. When at all possible it is desirable to do a prostatectomy if the gland is enucleable.

Hemorrhagic cancers may be treated by endo urethral resection but cystostomy should be avoided as much as possible in these cases. This should be followed by roentgen therapy with small doses of radiation to the pelvis once this augments the coagulability of the blood and thereby contributes to hemostasis.

In cancer of the prostate which has already been observed during cystostomy, the authors recommend endo urethral resection. Then the bladder drain should be closed and the patient should urinate through the usual channels. As the result of their experiences the authors find that this apparently radical procedure does away with pain and infection from the catheter.

The authors consider endo urethral resection a great advance in the treatment of prostatic malignancy.

JACOB E. KLEIN, M.D.

**Ruksting G. J. and Weller C. G. Spindle Cell Sarcoma of the Prostate: A Review of the Literature and Report of a Case. J. Urol. 1939 41 911**

Symptoms of sarcoma of the prostate as a rule do not arise unless there is some obstruction either in the urinary tract or to the passage of a stool. At times it is difficult or impossible to pass a cystoscope and after a difficult passage the instrument assumes an unusual position.

The elements which normally constitute the prostate gland seem too limited to account for all the types of sarcomas encountered and it is debatable whether many of them as reported are not anaplastic carcinomas of the gland.

The rapid growth of prostatic sarcoma is demonstrated clearly in several patients treated surgically. Tumors of the spindle cell variety metastasize to the bladder, perineum and lungs after perineal incisions.

The authors report a case of a boy, two years of age, who had difficulty in voiding urine shortly after he had recovered from an upper respiratory tract infection. Two months after the onset of symptoms, rectal examination disclosed a firm, smooth mass originating in the prostatic region and extending to



the left of the midline to 1 in. below the umbilicus. A cystogram revealed a large filling defect in the base of the bladder involving its lower one third. Biopsy of the bladder mass was diagnosed as myxosarcoma. Two and one half months after the onset of the symptoms the patient developed uremia and died.

Histologically, the prostate gland was remarkably altered. Its tubules encountered at wide intervals were surrounded by sparse infiltrations of lymphocytes which occurred in concentric rings in edematous tumor tissue. The tumor cells were typically spindle shaped, grew in brushlike masses and penetrated muscle and connective tissue in broad bands. In the bladder the epithelium covering the tumor masses was intact and lay on an edematous connective tissue layer which separated it from the invading tumor.

The typically rapid clinical course and pathological features of this particular growth are emphasized. **ELMER HESS M.D.**

Hinman, F. and Johnson, C. M. The Differential Diagnosis of Acute Fat Necrosis in the Scrotum. *J. Urol.* 1939 41: 726

The authors point out that the only lesions of the scrotum and its contents which require immediate

recognition and treatment are extravasation of urine hemorrhage into the scrotum, and torsion of the testicle or appendices. The two first mentioned are easily recognized and the latter usually is identified readily.

Recently they encountered 3 cases of acute fat necrosis of the scrotum, and in 2 of these they were in grave doubt as to the diagnosis and treatment. It was impossible to rule out partial torsion before operation. All 3 cases occurred in stout young boys before puberty, each of whom was known previously to have normally placed testicles. In 2 instances the lesion followed mild but rather prolonged trauma to the scrotum. In the third the cause was obscure. The onset was acute, accompanied by moderate pain and tenderness with no other local findings, such as edema or ecchymosis except a mass which could not be recognized as being separate from the testis in the first 2 cases. Pathologically the lesions resembled fat necrosis found elsewhere.

The condition was of interest chiefly because of its location in the scrotum which brought up a problem in differential diagnosis not previously encountered. **JOHN G. CHELTHAM M.D.**

#### MISCELLANEOUS

Bowie, F. J. T. Anderson, T. F. Dawson, A. and Mackay, J. F. The Treatment of Gonorrhea by M & B 693. *Brit. M. J.* 1939 1: 711

The treatment of 127 cases of gonorrhea in the male is described. The drug administered was 2 sulfanilylamidopyridine, a derivative of the original protosil discovered by Domagk and his assistants.

The standard of cure insisted upon by the authors is detailed. It rests upon 2 clinically negative periods of observation and upon 2 examinations and tests of cure each test being completed by 2 further examinations. The first and second tests were begun at an average of twenty five and sixty days respectively and completed at an average of thirty two and sixty seven days respectively while the final observation (urethroscopy) was performed in approximately seventy four days from the cessation of treatment.

Thirty patients in this series ceased to attend or were transferred to other centers before final tests of cure could be carried out. Of the remaining 97 patients 91 passed all tests of cure hence the authors consider the results to have been successful in over 93 per cent. There were 6 failures. Of the patients who ceased to attend it is probable that 8 were cured, cure was doubtful in 17 and 5 transferred elsewhere for treatment.

Toxic reactions encountered in these patients were of the minor type and varied in incidence with the dosage employed. The effects noted were drowsiness, lassitude, a general sense of malaise, headache, nausea, vomiting, insomnia, generalized pruritus, dyspnea with mild methemoglobinemia, mild cyanosis and sweating at night. These reactions subsided rapidly on withdrawal of the drug, and no major

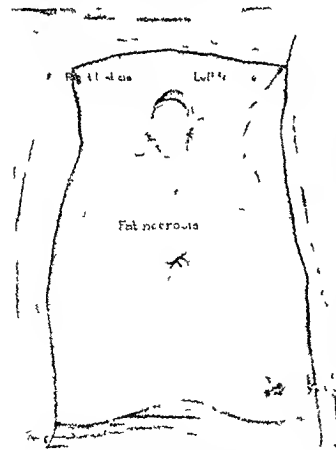


Fig. 1. Location of fat necrosis in both sides of scrotum which simulated testicles. Just above is shown actual location of the testes as they were found at operation.

toxic effects have developed. No rashes occurred in this series.

Various dosage schemes have been tried and it is suggested that intensive treatment over a short period merits further investigation. The great bulk of cases of gonorrhea may be cured by a total dosage of from 15 to 20 gm. The majority may also be cured within a week. Under this system the patient is made to swallow 4 gm. on the spot that is before he leaves the examination room. He is then given detailed instructions regarding general considerations of behavior including the special precautions which should be observed in taking drugs of the sulfonamide group and is told to take 2 gm. in another four hours then 1 gm. at four hour intervals during waking hours until the end of a period of roughly seventy-two hours from the beginning of treatment. The actual amounts taken aggregate from 6 to 8 gm. on the first day and from 4 to 6 gm. on the second and third days. Treatment may be prolonged for another day or so at the same rate or at a lower rate of 1 gm. thrice daily the rate depending more on the clinical response (freedom from discharge) than on the bacteriological results.

Treatment should be instituted at the earliest possible moment particularly in consideration of

the noteworthy absence of complications in cases which are so treated.

It is probably advisable to avoid anything less than 3 gm. daily as the initial dose in treatment. In initial amounts above this and in degrees short of undesirable toxicity it may yet be established that the higher the initial dose the speedier may be the cure the greater the proportion of cures and notwithstanding a high incidence of minor reaction for a short period the greater may be the immunity from major or serious reactions. Though cases of gonorrhea in females are not included in this report mention is made of the fact that as a rule women are less tolerant to this drug than men. Children on the other hand with comparative doses appear to have the greatest tolerance of all.

In case of failure of response within a week or of early relapse persistence with this drug even in repeated courses, has proved ineffective. In the interests of the patient in such circumstances, resort should be made to some other form of treatment.

In the experience of the authors this drug has proved the most effective therapeutic agent yet introduced in the treatment of gonorrhea.

C. TRAVERS STEPIZA, M.D.

# SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

## CONDITIONS OF THE BONES, JOINTS, MUSCLES TENDONS, ETC

Mondor H Ducroquet R Leger L and Laurence G A Case of Disseminated Fibrocystic Osteitis with Pigmentation of the Skin and Precocious Puberty (Un cas d'ostéite fibro kystique disséminée avec pigmentation cutanée et puberté précoce) *J de chir* 1939 53 593

Mondor and his associates report a case of disseminated fibrocystic osteitis with pigmentation of the skin and precocious puberty in a girl fourteen years of age. The history showed that pigmentation of the skin in certain areas had been present since birth, fracture of the neck of the left femur had occurred at the age of seven after a slight injury. Menstruation had begun at the age of seven and was accompanied by enlargement of the breasts and the appearance of some pubic and axillary hair. At the time when the patient was first seen, she showed unusually advanced physical development for her age. The breasts and the pubic and axillary hair were those of an adult woman. There were numerous pigmented areas on the left side of the abdomen and back and on the left thigh and leg. The left hip showed a deformity. Radiographic examination showed the typical picture of fibrocystic osteitis involving the ribs on the left side, the left iliac bone, the left femur and the left tibia and fibula. None of the bones on the right side were involved, the skull showed no abnormalities, the sella turcica was of normal size.

In a review of the literature the authors find 11 other cases of this type in girls or women. In some of these cases menstruation began earlier than in the authors' case even in infancy in one instance. The first fracture also may occur at an early age, and may be attributed to injury but is followed by some deformity of the bone which, however, does not interfere with function. Later fractures that may occur are usually definitely pathological. Radiographic studies in these cases show the fibrocystic lesions involving only certain bones while the rest of the skeleton appears entirely normal, no general decalcification of the bones is observed as in Recklinghausen's disease. When examination has been made in young children the bony development and fusion of the epiphyses has been found to be advanced beyond the stage normal for the age of the child. Histological examination of a biopsy specimen of one of the bones involved in 6 cases (including the authors') has shown lesions of fibrocystic osteitis.

The second element of the syndrome is the pigmentation of the skin, which, as in the authors' case is found only in certain regions and on one side of the body. Biopsy in a few of the cases, including the case reported by the authors, showed the pig-

mentation to be due to an excess of pigment, apparently melanin occurring in the melanoblasts of the chorion.

The third element of the syndrome in the female is precocious puberty, characterized not only by the early appearance of menstruation but also by the precocious development of secondary sex characteristics. In one case menstruation began at six months, accompanied by hypertrophy of the clitoris and the labia, in another case at three years with practically complete development of the secondary sex characteristics. In some cases the precocious sex development may be accompanied by an arrest of growth associated with advanced bony development. The mental development of these patients is often retarded; this may be due in some instances to the fact that their school attendance has been irregular because of multiple fractures.

Blood and urine analyses in several of these cases have shown the blood calcium to vary from 8.8 to 12.6 mgm per 100 c.c., in the latter case it subsequently dropped to 10.6 mgm. In the authors' case the blood calcium was 11.0 mgm. The blood calcium is therefore, usually within normal limits with some tendency to increased values. The calcium balance was normal in 3 cases in the authors' case and in 1 other case the urinary excretion of calcium was slightly increased. In 3 cases the phosphatase of the plasma was within normal limits, in another of the cases it was 4 times the normal, and in the authors' case increased by 300 per cent. The determination of the gonadotropic hormone in the urine showed it to be at the normal level in the authors' case and in 2 cases reported by Albright. Interferometric examination of the serum in the authors' case indicated no hormonal abnormality. In several of the cases reported in which surgical exploration of the parathyroids was done, and in 1 case in which surgical exploration of the adrenals was done, no pathological change was found.

In 9 cases reported in males fibrocystic osteitis of the same type has been associated with pigmentation of the skin, but not with any signs of precocious puberty. In other respects these cases are very similar to those reported in females.

While Albright considers that such cases represent a definite clinical entity, the authors note that they resemble in many points neurofibromatosis with bone lesions and also xanthomatosis. Further studies are necessary to determine the true significance of this syndrome.

Alice M. Meyers

Maurer G Metabolism Examinations in Acute Bone Atrophy (Stoffwechseluntersuchungen bei akuter Knochenatrophie) *63 Tag d. deutsch. Ges. f. Chir.* Berlin 1939

Sudeck in his opus "The Collateral Inflammatory Reactions of the Limbs" (this is his term for hony

atrophy) formulated his principles that led him to the conclusion that bone reconstruction is not merely frequent nor regular but is an interrupted i.e. a necessary consequence of a fracture or of some other injury and that it is by no means necessary to assume the existence of a special constitutional adaptability.

In the exceptionally numerous cases of injury at the Munich Clinic which consist of a great abundance of fractures distortions and contusions the author has not seen atrophy of bones in large numbers at any rate no cases that could be affirmed roentgenologically. The many roentgen examinations were made in a systematic manner while search was made for the presence of atrophy. In only 126 (3.4 per cent) of 2,323 fractured limbs in one year bone atrophy could be firmly established. It was also found in 5.5 per cent of 668 distortions and in 1.1 per cent of 87 luxations. The majority of his fractures healed without any atrophy that could be proved roentgenologically.

Notwithstanding the findings here mentioned the author is inclined to credit a constitutional preparedness for the cure of acute atrophy of the bones. He noticed that frequently early and serious atrophy of the bones occurred after traumas in patients having slight bulbus protrusions very lustrous eyes a flat neck a somewhat enlarged thyroid an increased tendency to sweat in the hands and feet dermographia variances of body temperature easily aroused tachycardia and many similar conditions.

Von Bergmann classified these individuals as being vegetatively stigmatized and believes this group is very susceptible to other ailments. He believes that disharmony in the vegetative system leads to a tendency toward functional disturbances in the organic system. The author gave special attention to the determination of the basic metabolism of those patients in whom acute bone atrophy was demonstrable roentgenologically and he was surprised to find all of them had an increase in their metabolic rates. All these examinations were conducted according to the strict requirements of metabolism tests. The control examinations of other fracture patients resulted in normal reactions. A tabulation of the higher metabolic rates is appended to the original article.

Knipping states that in about 85 per cent of the normal controls examined the variation from the normal metabolism was below 7 per cent. Hence according to these tests rates under 7 per cent cannot be considered as of any significance. However since there was an increase of the metabolism rate in all the cases the author believes that all cases with even a slight increase must be given special attention. As people with increased metabolism rates are especially liable to develop acute atrophy of the bones he attempted to lower this rate with different preparations. Ergocholin and Vitamin A gave the best results.

(MAUCK) MATTHIAS J. SEIFERT M.D.

Ceschke C. I. and Masentz I. H. Affections of Muscles. *J. Bone & Joint Surg.* 1939 21 5/6

The authors present two distinct pathological groups of cases in their study of muscle affections: one inflammatory or myositic and the other neoplastic.

Myositis is a frequent sequel of injuries mechanical irritation muscle paralysis and vascular disturbance. Pyogenic bacteria and toxins are frequent etiological factors. Syphilis non contiguous tuberculosis and exanthematic diseases occasionally produce muscle inflammation. Myositis may be acute chronic solitary or multiple. It occasionally occurs in epidemic form.

Of the 153 cases of muscle affections involving the extremities body wall and the neck there were 108 cases in the inflammatory group 15 cases of tuberculosis 8 of syphilis 6 of trichinosis 19 of chronic non specific myositis 1 of postdiphtheritic inflammation 2 of chronic inflammation associated with progressive muscular atrophy and 25 cases of myositis ossificans. The remaining cases of the chronic inflammatory group were associated with torticollis and Volkmann's ischemia. There were 8 cases of acute inflammation.

Differential diagnostic features and pathological descriptions are presented for the various types of acute and chronic myositic inflammatory reactions. Diagnostic difficulties arise more frequently in cases of chronic myositis than in cases of the acute form and unless there is a characteristic clinical picture such as Volkmann's contracture the clinical examination should aim to rule out tuberculosis syphilis trichinosis or the exanthematic diseases. In obscure cases a biopsy should be done.

Neoplasms of muscle arise primarily from primitive muscle tissue or secondarily from nerves blood vessels fat or connective tissue. Primary muscle tumors are related to primitive muscle tissue adult muscle fibers are incapable of reproduction. All muscle cells have their origin in mesenchyme and the individual cells are formed through an intermediate stage in which the spongiosoplasm of the syncytial cells is drawn out into longitudinal processes. A myoblastic stage in which the protoplasmic processes become striated precedes the formation of voluntary muscle. Tumors of muscle attempt to repeat the histogenesis of the structure involved and are recognized microscopically by the forms assumed. In the formation of tumors of smooth muscle the mesenchyme gives rise to elongated wavy muscle fibers which do not necessarily assume the histological structural characteristics of normal tissue and malignancy is characterized by the presence of many bizarre forms of multinucleated cells. The embryonic cells of voluntary muscle tumors produce myoblasts. These myoblasts may be similar in appearance to the foam cell of the reticulo endothelial system.

In the files of the Johns Hopkins Hospital there are recorded over 600 involuntary muscle tumors the so called leiomyomas. All but 38 originated in

the uterus the remainder with 1 exception were distributed in the genito urinary and gastro intestinal tracts. There were 64 instances of malignant tumor of smooth muscle designated as leiomyosarcoma. There were 19 instances in which striated muscle tumors, benign or malignant arose in the body wall or extremities. The most common type was the myoblastoma. The most frequent locations were in the tongue and oral cavity. There were 13 cases of undifferentiated rhabdomyosarcoma. The benign non indigenous tumors invading muscle were as follows: 5 angiomas, 10 fibromas, 1 lipoma and 1 fibromyxoma.

The treatment in 5 cases of benign muscle tumors was simple excision. There were no recurrences. Excision was also done in 13 cases of primary malignant muscle tumors. Recurrences occurred in 10 instances and 2 cases were not followed up. Amputation was performed primarily in 1 instance. The follow up in this case was not complete. The authors believe that in primary malignant tumors of muscle amputation is the operation of choice and that there is no correlation between the microscopic variety and the clinical course.

ROBERT F. MONTGOMERY, M.D.

Manzanilla, M. Congenital Atrophy of the Distal Portion of the Ulna (*Atrofia congenita cubital distal*). *J. internat. de chir.* 1939 4 355

Anomalies of development of the extremities are in the majority of cases due to a cessation of, or an abnormality of the process of evolution. Extremities appear to vary to the end of the third week or beginning of the fourth week of fetal life.

The ulna has 1 primary and 3 secondary ossification centers. Congenital anomalies or malformations are due to disturbances of osteogenic function. Disturbances of the evolution of the skeleton may result in either hypertrophy of the bones or arrested development of the limbs. A monster with the last mentioned abnormality is called an ectromelus. Three theories explain congenital malformations: (1) cessation of the embryonal development, (2) arthrotic adhesions and (3) malposition of the limbs.

The author reports a case of congenital atrophy of the distal end of the right ulna in a sixteen year old boy, and he believes that this is the first case reported in the literature. Blandin in 1837 described a congenital malformation of a diametrically opposite type namely, a congenital atrophy of the proximal end of the ulna. A complete absence of the ulna has also been reported. In the author's case the abnormality was responsible for a 3 cm. shortening of the right upper extremity. Flexion and extension of the elbow were normal but those of the hand were limited; there also was a limitation of supination and pronation of the hand. The Wassermann reaction was negative. The accompanying roentgenogram illustrates the deformity. Recklinghausen's disease or osteitis fibrosa cystica, was considered in the differential diagnosis.



Fig 1 Roentgenogram

As to therapy the author suggests an autoplatic graft from the tibia and supportive treatment in the

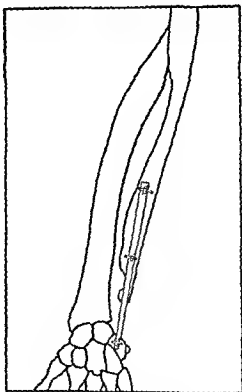


Fig 2 Autoplatic graft

form of administration of calcium adrenalin para thyroid extract Vitamin D and ultraviolet light

J. W. K. NARAYAN M.D.

Trivelli L. Ischiatic Paracoxalgia. Statistical Study (Paracoxalgia ischiatica. Studio statistico). *Chir d organi di movimento* 1939 24 317

Paracoxalgias are painful syndromes which may simulate coxitis clinically and which include primary tuberculous localizations in the pelvic bones other than the hip joint and the lumbar part of the spine. Trivelli devotes the present work to the study of the ischium.

The etiology of tuberculous osteitis of the ischium offers nothing new. The disorder is found most frequently in the third decade of life. In the author's cases the youngest patient was aged four and one half and the oldest forty one years. The proportion of male to females was 10 to 1 and the frequency of occurrence of the disorder in relation to coxitis and other paracoxalgias was 12 to 652. It begins insidiously with a feeling of stiffness of the hip which disappears with rest. Gradually vague pain is experienced which is aggravated by walking and erect posture then limping sets in and abscess appears finally. However the only symptom revealing the disorder may be the abscess. Clinical diagnosis is possible in all cases before roentgen examination because palpation will reveal a very painful point corresponding to the tuberosity or the ram of the ischium. The abscess nearly always points at the root of the thigh or in the gluteal region. Defective posture is generally little marked and functional limitation of the hip joint is at the expense of flexion extension and abduction.

The anatomico pathological picture consists of areas of bone destruction filled with fungous growths and pus which are usually located in the tuberosity of the ischium. Lesions of the body of the bone are rare. Sequestra of various sizes are found in 60 per cent of the cases their elimination is slow and fistulas persist for a long time. The collections of pus follow the route of least resistance. The dry form of tuberculosis of the ischium is rare.

Roentgen examination confirms the diagnosis and gives precise information of the lesion for which a period of invasion destruction and repair may be distinguished. Destructive processes may be variously combined with repair processes starting from the periosteum. Pathological fracture is difficult to demonstrate.

A differential diagnosis must be made from other tuberculous lesions inflammation of the psoas muscle sciatic neuralgia and osteomyelitis.

The treatment is local and general and the best results are obtained from conservative treatment. Surgical intervention is indicated in some cases for the removal of sequestra which cause protracted suppuration. Heliotherapy is given during the periods of abscess and evolution. According to the progress the patient is allowed to walk with a plaster cast after from six to twelve months. In

only 1 case was it found necessary to curette the hip joint on account of secondary infection. Three cases are described. The prognosis is more favorable in younger than in older subjects in whom the disease lasts much longer and good repair is difficult to obtain.

RICHTARD KEMEL M.D.

Busaffini M. Acute Osteomyelitis of the Hip (Osteomyelie acuta dell anca). *Chir d organi di movimento* 1939 24 425

Busaffini limits his study of osteomyelitis of the hip to cases occurring in adolescents and adults and notes the relative frequency with which the process attacks the hip primarily or secondarily.

The beginning of the disease is easily recognized in primary localization in the hip but in secondary localization it may escape the attention of the physician because the patient is already in a bad condition. The lesion is then recognized when the hip joint is seriously damaged. The diagnosis of osteomyelitis of the hip is made easily from the typical position of the limb in flexion abduction and external rotation the articular rigidity due to muscular contraction the marked pain caused by pressure on the femoral head and trochanter and the rapid swelling of the root of the thigh. The differential diagnosis includes only tuberculosis which at times presents an acute form resembling osteomyelitis. The sudden rise of temperature from the beginning the serious toxic condition of the patient who is usually a robust subject the presence of small lesions on the leg which have served as portals of entry for the staphylococci and the rapid evolution of the process point to osteomyelitis.

The disease may be fatal within a few days but in general it tends toward a chronic evolution under two distinct forms: suppurative with formation of large collections of pus in the iliac fossa or along the femur and non suppurative. The latter is by far the most frequent form. Destruction of the articular head predominates and it is only later when the infectious process is spent that small abscesses may form with elimination of thin lamellar sequestrums. The tendency toward pathological dislocation is very marked and rigid ankylosis is usually the final result. However the possibility of the restoration of function is not excluded even in the presence of great destruction of bone which may undergo more or less regeneration.

Roentgen examination shows early and intense decalcification in the involved parts and rapid destruction of the femoral head and acetabulum which lead to pathological dislocation. This is followed in some cases by repair which substitutes a solid bony block for the articulation. In other cases repair re-establishes very nearly the individual form of the bones probably because the osteomyelitic process has spared a strip of periosteum and the cartilaginous coverings. In some of these cases nearly normal function of the joint results but in most of them this is prevented by the presence of bony bridges uniting the femoral head to the

acetabulum and leading in time to complete fusion of these parts

The experience of the author with 10 severe cases shows that conservative treatment gives the best results. He immobilizes the hip joint first by traction with weights and then by means of a plaster cast. After the first days, the pain decreases under traction but the temperature persists and complete immobilization is needed before the temperature begins to fall slowly and gradually until it reaches normal; this takes about one month. In view of the great tendency toward ankylosis, the plaster cast must maintain the limb in the favorable walking position of slight flexion and abduction. The cast will prevent pathological dislocation. Arthrotomy cannot drain efficiently and may cause secondary infection; it should be condemned as well as any other surgical intervention. Among the 10 cases treated, 8 were cured with ankylosis in good position and 2 with conservation of articular movement. Abortive forms may be observed. If a collection of pus has to be opened it can be drained easily through a window in the plaster cast.

RICHARD KEMEL, M.D.

### SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Cleveland, M. *The Surgical Treatment of Joint Tuberculosis*. *J Bone & Joint Surg* 1939 21 607

Cleveland presents a statistical analysis of a series of 310 patients treated surgically for joint tuberculosis. He employs the following classifications according to the degree of involvement:

1. Patients with no evidence of pulmonary tuberculosis
2. Patients with pulmonary tuberculosis and negative sputum with no metastatic spread to other organs
3. Patients with pulmonary tuberculosis and positive sputum
4. Patients with pulmonary tuberculosis and negative sputum with metastatic spread to other organs

Groups 1 and 2 had a combined mortality of 9.5 per cent and 3 and 4 had a mortality of 48.2 per cent. The author believes that comparisons of statistical studies are valueless unless a uniform classification of the types or degrees of cases is utilized.

Sixty-eight per cent of his series of cases occurred in the first three decades of life. The highest mortality was in the third decade. Emphasis is placed on the necessity of treating each case for general tuberculosis as well as for the local tuberculous involvement.

DANIEL H. LEVINTHAL, M.D.

Piñeyro Sorondo, J. and Esperne, P. *Paths of Approach to the Humerus* (*Vías de acceso al húmero*). *Rev de ciruj de Buenos Aires* 1939 18 63

The authors discuss the paths of approach to the humerus and their value in every possible operation

on this bone. They advise that before analyzing any of these routes one make a careful study of the anatomy of the arm.

For instance, the brachialis anticus has been described as being covered almost completely by the biceps muscle, but, in fact, a large part of it lies outside of this muscle. The brachialis anticus can be seen outside of the biceps from its upper attachment to the joint line of the elbow, and it can be felt through the skin between the brachioradialis and the biceps muscles.

Moreover, the brachioradialis muscle has been described as a supinator when it is only a powerful flexor of the forearm which brings the hand to an intermediary position neighboring the extreme pronation, when the elbow reaches a right angle.

Another common mistake is to consider the sulcus bicipitalis lateralis as the interspace between the biceps and the brachioradialis muscles. The sulcus bicipitalis lateralis, which can be seen and felt in the clinical exploration of the elbow, does not answer to this description when the elbow is in the surgical position of extension and supination; there is always a part of the brachialis anticus between these muscles which is the sulcus of the nervus radialis and the arteria profunda brachii.

A medium groove between the brachialis anticus and the biceps contains the nervus musculocutaneus.

An internal groove is the real sulcus bicipitalis medialis between the biceps and the septum intermusculare mediale which takes the nervus medianus and the arteria humeralis. The nervus radialis divides itself into two branches at the level of the elbow joint line.

The knowledge of these grooves is one of the most important factors in the performance of operations on the lower part of the humerus.

The authors describe many of the possible routes of approach to the humerus and classify them as follows:

1. Approach to the humerus from the head to the tuberositas deltoidea
2. Approach to the humerus from the tuberositas deltoidea to the lower extremity
3. Approach to the humerus as a whole

The approach to the humerus from the head to the tuberositas deltoidea can be made through the axilla. The incision is the same as for exploration of the arteria axillaris. The bone lies beneath very important vessels and nerves, which must be retracted and which are covered by the musculus subscapularis. This makes the axillary route an exceptional and difficult one.

The supradeltoid route follows the superior border of the deltoid muscle, which can be detached or incised near its superior attachment. In some techniques osteotomy of the bone is performed according to the attachment of the muscles; for instance, osteotomy of the acromion and of the clavicle. These methods are good but they do not yield enough exposure so that they must be completed with other incisions.

The retrodeltoid route is appropriate for exposure of the nervi radialis and axillaris but if good exposure of the head of the humerus is desired the Kocher incision should be employed which is a combination of the retrodeltoid and supradeltoid routes with osteotomy of the acromion and temporary disarticulation of the clavicle. The presence of the nervus axillaris limits the usefulness of this route to 6 or 7 cm under the acromion.

The transdeltoid routes separate the deltoid fibers. Any transdeltoid incision which goes deeper than 6 or 7 cm under the acromion sections the nervus axillaris and causes paralysis of the muscular fibers medial to the incision. The best route of all is the anterior transdeltoid (Ollier). This is the only route which can be prolonged downward to the elbow and sacrifice only a very small part of the muscle. The incision begins at the base of the processus coracoideus and follows 3 or 4 in parallel to the sulcus deltopectoralis.

The interdeltopectoral route is not as good as the preceding one because the incision of the sulcus deltopectoralis cuts some vessels which causes unnecessary bleeding and also because of the presence of the vein and the arteria thoraco-acromialis which are avoided when the anterior transdeltoid incision is used.

In the approach to the humerus from the tuberositas deltoidea to the inferior extremity the presence of the intermuscular septa and of the two compartments formed by them and the bone allows 6 different ways of approach to the inferior half of the humerus.

The medial retrosepal route is an excellent means of exposing the lower half of the bone. The cutaneous incision follows the lower half of a line starting in the axillary part of the musculus coracobrachialis and ending in the epicondylus medialis. This route cannot be used if one wants to reach the upper part of the humerus because there are a number of veins which pass from the anterior to the posterior compartments of the arm and proximal to this venous plexus the field is crossed by the nervi radialis and cubitalis. More proximally one encounters the tendons of the musculus latissimus dorsi and the teres major.

By the internal presepital route the bone is reached with the same incision but before the medial septum the brachialis anticus must be dissected from the septum. The exposure of the humerus is not as good as that obtained by the approach last described.

External routes. These are very inconvenient because of the presence of the nervi radialis and axillaris. Therefore they can be used only in segments of 5 cm under the acromion (external transdeltoid) of 6 cm near the tuberositas deltoidea and of 8 cm just over the lateral epicondylus.

The authors recommend the lateral approach to the elbow joint. Its use in operations on the humeral shaft may cause serious lesions of the nervi radialis and axillaris with possible irreparable damage.

The posterolateral approach between the caput laterale and caput longum of the triceps brachii exposes the nervus radialis which makes it undesirable for the exposure of the bone.

Of the anterior routes the best is the one which exposes the bone by division of the brachialis anticus along its fibers. The next best is the one which employs the sulcus of the nervus radialis.

The entire humerus may be approached by the incision of Largh Kocher which follows the superior part of the sulcus deltopectoralis and once reaching the tuberositas deltoidea takes the external presepital route (septum intermusculare laterale) and the groove between the brachioradialis and brachialis anticus.

This route exposes the nervus radialis which must be retracted laterally. It is undesirable and may be followed by severe lesions of the nerve.

The approach of Finocchietto protects the nervus radialis during and after the operation. The best procedure is to approach the bone between the fibers of the brachialis anticus instead of passing between this muscle and the brachioradialis. It is true that in this way the lateral part of that muscle is sacrificed but it is worth while to sacrifice the lateral fibers of the brachialis anticus in order to preserve the integrity of the nervus radialis.

Finocchietto performed his first operation of this type in 1913.

The incision starts at the processus coracoideus and goes downward from 5 to 10 cm. lateral to the sulcus deltopectoralis. Once near the tuberositas deltoidea it curves slightly inward following the lateral border of theiceps. At a point 10 mm. from the tuberositas deltoidea and at a point 5 mm. in front of the joint line of the elbow 10 cm. over the epicondylus lateralis a marking signals the crossing of the lateral border of the humerus by the nervus radialis. The bone can be exposed in its entirety, it being necessary to tie only a few vessels (arteria circumflexa anterior).

If the operation requires exposure of a segment of the humerus one can employ only a part of the incision: the upper third in the operations on the joint and head, the middle third in operations on the shaft and the lower third in operation on the lower end especially in supracondylar fractures or non unions.

The authors consider this route the best of all. It follows the direction of the bone, it goes almost exactly in the boundary between the territories of cutaneous innervation, it does not section the septum lateralis. It separates muscles which have different innervations inward the pectoralis major, biceps brachii and brachialis anticus and outward the deltoideus, triceps brachii, brachioradialis and both extensors carpi radialis. The nervus musculocutaneus is protected by the fibers of the brachialis in the medial border of the incision. The nervus radialis is protected by the external fibers of the brachialis as has been shown.

The authors give a very precise description of the technique with examples. HECTOR MARINO, M.D.



## FRACTURES AND DISLOCATIONS

Ottolenghi and Costa Orr's Method in Open Fractures (El método de Orr en las fracturas complicadas) *Bol y trab Soc de ciruj de Buenos Aires*, 1939 23 225

There are some fundamental principles in the treatment of open fractures one of them is strict immobilization which can be considered as axiomatic. The authors think not only that the treatment of these fractures is a technical problem but that biological and infectious factors must be considered.

With Valls they have seen more than 300 fractures of this type not including those of the fingers. They have seen lesions of every possible origin. All of the patients were treated by strict immobilization of the fracture, postural drainage, setting of the limb in the most favorable position and dressing of the wound at long intervals. They have never had to regret following this systematic line of conduct but the results have not been the same in all the patients: the wounds were closed or not closed, the chance depending upon the local condition and in some cases the progress was satisfactory but in others there developed pyogenic or anaerobic infection. The infectious phenomena could be seen even with strict immobilization of the fractures. The authors think that serotherapy is of value and are confident that the anti-gangrenous serum has saved some limbs which appeared to be doomed to amputation because of anaerobic infection. The large doses of anti-gangrenous serum, given intravenously every two hours have been very efficacious.

Regarding closure the author says:

1 In any case of open fracture strict immobilization must be imposed.

2 Immobilization induces a better response of the lesions, but it alone does not solve the problem of the treatment of the open fracture. Infectious complications may occur in spite of it.

3 The response of these lesions depends chiefly on the state of the patient, the violence of the trauma, the extent of destruction of tissues, and the virulence of the organisms present.

4 The biological action of the serotherapy permits excellent results without abandonment of the principle of absolute rest of the region.

5 The wound must be carefully watched so that complications may be recognized immediately.

HECTOR MARINO M D

Valentini F B A Contribution to the Surgical and Conservative Treatment of Fracture of the Head and the Neck of the Radius (Contributo al trattamento chirurgico e conservativo delle fratture della testa e del collo del radio) *Ibidem* Rome 1939 46 sez chir 249

Valentini states that no matter what kind of fracture of the upper extremity of the radius is present, there is only one thing that has to be considered from the therapeutic point of view: the

degree of displacement of the fragments. If roentgen examination shows that the epiphysis has kept its form and its orientation in relation to the diaphysis intact, a short immobilization followed by early and moderate physical treatment will give anatomically and functionally perfect results, on the other hand, if roentgen examination reveals any displacement, the object of the treatment must be to re-establish in the simplest and surest manner the normal anatomical form of the radius, in order to obtain complete restoration of function. Resection is admissible only in cases in which it is found absolutely impossible to reduce the fragments and to keep them reduced, or when, at the time of a second intervention to correct the poor anatomical and functional results of a first operation, it is found that the condition of the radius cannot be improved. In these cases, the resection must be generous and include the entire epiphysis down to the insertion of the brachial tendon. In order to avoid the formation of osteophytes between the radius and the humeral condyle, which would interfere with function, care must be taken to remove even the smallest fragments of bone and shreds of periosteum and to cover the radial stump with an aponeurotic flap, to insert a perosteal flap into the medullary canal of the previously excavated neck of the bone or to cover the bone with a rubber cap.

Valentini describes 6 cases, 4 of which he treated surgically and 2 non surgically. He offers the following additional considerations:

1 To correct fractures with valgus, the patient is anesthetized and traction with strong adduction of the forearm on the arm is used: the limb is immobilized in extension, adduction and supination for two weeks after which physical treatment is instituted.

2 Fractures with displacement of the fragments, which deform the epiphysis may in special cases be subjected to closed manipulation but should in general be treated surgically.

3 Resection should be limited strictly to the cases previously mentioned.

4 Incision should be made exactly where the head of the radius is most superficial.

5 Suture material may be metal silk or catgut. If the fragment has no tendency to become displaced the annular ligament may be used as a means of retention. If damaged the annular ligament and the articular capsule must be repaired.

6 Early operations give better results than second stage operations.

7 Even in comminuted fractures, provided the fragments are not too small, replacement must be attempted.

RICHARD KEMEL M D

Greene J J and Smith D H Fractures of the Pelvis. An Analysis of 79 Cases. *Arch Surg*, 1939 38 830

This is a review of 79 cases of fracture of the pelvis treated at Harlem Hospital New York during a period of four years. The most common cause of

fracture is a fall from a height and the second most common cause is an automobile accident. The average period of hospitalization was twenty six days in uncomplicated and forty nine days in complicated cases. The diagnosis may be established by pressure on the pelvis at various points and by movement of the leg but the final diagnosis depends on roentgen study.

Associated intracranial, thoracic and abdominal injuries are common. Special attention must be paid to the bladder and urethra. Rupture of the urethra may be partial or complete, rupture of the bladder may be intraperitoneal or extraperitoneal. Neural involvement is not uncommon, particularly in fractures of the posterior rim of the pelvis. The nerves frequently affected are (1) the lumbosacral cord at the pelvic brim, (2) the sciatic nerve and (3) the obturator nerve. Neuralgia is a common result of these injuries. Disturbances of sensation are not uncommon, especially when the lateral cutaneous nerve of the thigh is involved. When the lumbosacral plexus is involved the common symptoms are weakness of the flexors of the toes and weakness of the muscles of the calf. Involvement of the peroneal nerve causes foot drop.

The authors' treatment has been simple. The uncomplicated fracture requires little more than strapping or rest in bed. The suspension sling is used when there is a separation of either the symphysis or the sacroiliac joint. When there is a marked upward or downward displacement the authors use the Russell traction to the affected side. They do not use the Russell traction if there is renal infection for the position of the body is not conducive to good kidney drainage. In all their cases cystograms are taken as a routine. They have no fear of introducing infection from without. In the presence of vesical injury immediate laparotomy is performed. In the presence of urethral injury their first concern is to prevent extravasation of the urine. Further operative procedures then wait on the patient's condition. Shock is prevented in the usual manner. Neural injuries are treated with dry heat, diathermy, braces or a splint and a cradle to relieve pressure from the bed clothes.

HAWTHORNE C WALLACE, M.D.

Godoy Moreira, F. E. Habitual Luxations of the Patella (Luxations habituelles de la rotule). *Rev d'orthop.* 1939 26 202.

Moreira notes that habitual or recurrent luxations involve either the shoulder or the knee. Recurrent luxations of the knee are of less frequent occurrence than those of the shoulder but they have more serious consequences. Persons with recurrent luxations of the knee are subject to frequent falls, fractures and even serious accidents.

Recurrent luxations of the knee occur most frequently in females. Heredity plays an important role as indicated by the fact that several members of a family may be affected. Other congenital malformations may be associated. There may be a

definite aplasia affecting all the articular and periarticular structures. Often a definite traumatism may cause the first luxation which is easily reduced but the condition recurs on the occasion of any insignificant trauma or spontaneously.

The luxation always occurs outward and usually when the knee is flexed and persons subject to such luxations dread going up and down stairs as this increases the flexion of the joint. Sometimes simple extension of the leg is sufficient to reduce the luxation. The patient can often do this himself. Radiographic examination of the knee in these patients often shows a definite valgus and an elevation of the patella. If the roentgenogram is made with the patient in the ventral decubitus and the leg flexed on the thigh it shows atrophy of the external condyle and of the surface of the patella that articulates with it.

If recurrent luxation of the knee is not treated it may cause considerable invalidism and reduction of working capacity. The patient is easily fatigued. There may be atrophy of the muscles and especially of the quadriceps. If a complete outward luxation is not reduced promptly the patella may be fixed in its abnormal position and the luxation becomes irreducible.

Surgical intervention is therefore indicated in cases of recurrent luxation of the knee. The technique to be used depends upon the conditions found in each case—especially the obliquity of the extensor muscles, the smallness of the external condyle, the degree of deviation of the knee in valgus and the degree of laxity of the capsule. Of the many techniques described the author considers those of Roux, Krogius, Albert, Mouchet and Albee as the best and most successfully adaptable to the different conditions found. Three illustrative cases are reported.

ALICE M. MEYERS

## ORTHOPEDICS IN GENERAL

Raagaard, O. Some Comments on Complications Occasioned by a Rustless Surgical Nail. *Acta chirurg. Scand.* 1939 82 475.

The treatment of fractures involving the neck of the femur by Sven Johansson's extra-articular method of using the Smith-Petersen nail is usually successful but it gives poor end results in a certain number of cases. While unavoidable complications sometimes occur, such as necrosis of the head and neck, resulting from the original trauma, a great part of the failures are due to lack of technical skill and incorrect after treatment. However, some of the failures which occur in expert hands are due to faults of the so-called rustless nail.

Raagaard reports a case in which a fracture through the middle of the femoral neck in a sixty-two-year-old man was treated with a Smith-Petersen nail. Suppuration later appeared about the nail which loosened and had to be removed.

The nail, which was of the ordinary three-flanged variety and of rustless steel, showed several large areas of corrosion. Near the head there was a

corrosion that had perforated the metal. A roentgenogram of the nail clearly revealed the defect and when the films of the fracture were reexamined with this in mind, it was found that the bone showed two areas of corrosion which corresponded to similar areas in the nail. The nail was sent to the National Testing Institute (Copenhagen) where it was found to be made of excellent steel but showed corrosions believed due to insufficient polishing. It did not react with vinegar. The surface showed numerous irregularities and an impression which had disrupted its continuity and predisposed it to local action. The rust resisting qualities of steel depend not only on the composition of the alloy but on the surface. The surface will not resist corrosion unless it is highly polished and free from blisters and other defects. Raagaard inspected his remaining stock of 12 Smith Petersen nails and decided that all of them were unserviceable because of a faulty finish. In fact 1 nail showed distinct rust spots. The nails had been made under an Ericsson patent.

Raagaard does not doubt that the corroded parts produced the suppuration and areas of osteoporosis because histological chemical analysis of the fistula showed the presence of iron and chromium in the

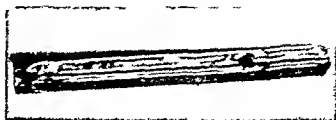


Fig 1 above The nail just after removal

Fig 2 below X ray picture of the nail

cells. Other investigators have reported necrosis and nutritive disturbances especially when the nail comes in contact with the synovia. In a number of cases the nails became loose and were removed. These difficulties, Raagaard states, are technical problems that could be solved by working in close co operation with engineers.

SAMUEL B. SPIRA, M.D.



# SURGERY OF THE BLOOD AND LYMPH SYSTEMS

## BLOOD VESSELS

Sunder Plassmann P. Raynaud's Disease and Its Various Forms (Die Raynaudsche Erkrankung und ihr Formenkreis) *Deutsche Ztschr f Chir* 1938 251 125

Attacks of a severe grade of pallor with severe pain (local asphyxia) and of cyanosis (local syncope) are characteristic of the disease picture described by Raynaud in 1862. These attacks affect the upper extremities predominantly but they also occur in the lower extremities as well as in the nose, ears, tongue, and penis; they always occur symmetrically. The attacks are produced by cold or even psychogenically; the pulse remains palpable even though of varying strength. Tissue changes if they appear at all appear only late and even then often only in the form of superficial necroses. A change in the position of the extremities produces no change in the color of the skin but it does produce changes in the temperature. The blood vessels without exception remain fully patent up to the tips of the fingers so that even Raynaud considered the disease as of vasomotor origin. In addition to the attacks there are trophic and sclerodermic changes; however there are no disturbances of sensation. During an attack of syncope there may be a lowering of the surface temperature to the extent of 20 degrees. Roentgenologically demonstrable changes in the form of rarefaction of the terminal phalanges of the fingers appear early. In contrast to endangitis obliterans the disease affects women very predominantly. A typical case in a patient aged twenty-seven years is described in detail in the original article.

After a review of all the previous etiologic theories (Raynaud: nervous vascular spasms as a result of vasomotor stimuli with a special nervous predisposition; Oppel: hyperadrenalinemia; Rieder: a pathological state of irritation in the vegetative nervous system; Frey, as well as Brown and Lewis: chemical decomposition and others) the author discusses in detail the course of the vasomotor nerve tracts about which our ideas have been substantiated extensively for a long time. However the fact elaborated by the author in conjunction with the Stoeckel school that every individual cell in the vascular walls is surrounded by an extremely fine nervous terminal reticulum is new. This type of innervation is the same in all blood vessels but an extensive peripheral independence is peculiar to this terminal reticulum. The formerly assumed possibility of operative denervation of a piece of the vascular wall therefore does not seem correct. The author presents the theory that not only the vegetative center and the conduction path but also the terminal reticulum is sensitized to stimuli of cold in Raynaud's disease. The pathological state of stimulation

of the vegetative nervous system in Raynaud's disease is based upon a peculiar complex process with involvement of numerous factors which include (1) infectious diseases (2) acquired or congenital lues (among Giroux 42 cases there were 14 with congenital lues) (3) signs of allergic reaction in the previous history like edemas, urticaria, Quincke's edema, migraine and rheumatism. The author suspects that the cause of Raynaud's disease is a localized toxic injury as a result of a peculiar state of reaction in the vegetative nervous system and a sensitization of this system produced thereby just as a localized lesion in the vascular wall is to be assumed as a cause of endangitis obliterans and he explains this theory in detail. The vegetative nervous substance then responds in a normal manner to subthreshold stimuli (cold excitation) with attacks with abnormal reactions which clinically present the picture of Raynaud's disease. These express themselves as circulatory disturbances which appear predominantly in the parts of the body most exposed to cold. As the anatomical basis of this toxic injury, the author in contrast to previous investigators found by means of the Bielschowsky method very marked pathological changes in the neuroplasm of the eviscerated sympathetic ganglia as well as in the rami communicantes. These are described in detail and illustrated in the original article.

Raynaud's disease is therefore no longer only a neurosis but also the result of the operative removal of the ganglia. In an experiment on acute hyperergism the author was able to localize a toxic albumin injury in the vegetative nervous system under certain conditions by way of the general circulation. Proceeding from the fact that thyroid secretion tones up the vegetative nervous system the author made the experimental animals hyperthyroid. In conjunction with this an anaphylactic shock was produced in the animals by repeated injections of swine serum after which the toxic injury localized itself in the vegetative nervous system; the ganglia were severely affected.

The author therefore presents the following theory for the pathogenesis of Raynaud's disease: temporary subfunction of the ovaries (it almost always affects women) followed by hyperfunction of the thyroid gland (Loeser) with the result that localization of a toxic injury occurs in the vegetative nervous substance in the presence of an existing allergic state of reaction of the organism and the further result that a hyperergic reaction to cold develops. Just as in every hyperergic reaction in the ganglion cells is not specific. In later stages of Raynaud's disease inflammatory reactions in the blood vessels are always found in endangitis obliterans may also take place.

The treatment of Raynaud's disease is discussed in detail. While conservative methods (static al

ternating baths suction compression padutin) may be adequate in slight and beginning cases, in severe cases satisfactory results can be achieved only with the surgical removal of the sympathetic ganglia, especially of the stellate ganglion. The awaited operative result must be tested previously by tests such as the use of a heating box or spinal anesthesia. It is peculiar that the same hyperemia achieved with operation which may produce local inflammation in the acute hyperergy experiment brings recovery in the fully developed disease picture when the antigen antibody reaction has already run its course. For the after treatment and the prevention of recurrences the administration of thyroid substance and Vitamin B under medical control has given the author good results.

(VON HASSELBACH) LOUIS NEUWELT M D

Berti Riboli, R Plastic Repair of Vascular Wounds with Heterogenous Material (Ribbon Catgut) Experimental Research (La plastica delle ferite dei vasi con materiale eterogeneo (nastro di catgut) Ricerche sperimentali) *Policlin* Rome 1939 46 sez chir 168

Various heterogenous and homogenous materials have been used experimentally by a number of authors for the plastic repair of transverse lesions of vessels but none has been found satisfactory because it has been impossible to prevent the early or late formation of thrombus and consequently to preserve the function of the injured vessel. Suspecting that the failures had been due largely to the quality of the materials used Berti Riboli decided to conduct his experiments with ribbon catgut,  $\frac{3}{8}$  in wide and  $\frac{1}{16}$  mm thick. He used 10 big dogs. After anesthesia with 1 cc of morphine per kgm of body weight, he exposed the femoral artery and stopped its circulation by lifting part of it between two loops of fine catgut without tying them so as not to damage the intima. He then sectioned two thirds of the circumference of the vessel and using 4 or 5 cm of ribbon catgut he wound it carefully around the vessel as on a spool, so as to cover the incision. A catgut oo ligature was loosely tied over the center of the ribbon to keep it from unrolling, the tissues were sutured and the limb was kept immobilized with a plaster splint for forty eight hours. The animals were sacrificed after from ten to thirty five days.

Nothing abnormal was noted in any of the animals during life. In animals killed fifteen days after the intervention the catgut sleeve was surrounded by a small quantity of serum and a slight connective tissue capsule there was moderate swelling and absorption had started on the external and internal aspects of the vessel which left only two central turns more or less unaltered. In animals killed twenty five and thirty five days after the intervention the catgut sleeve was surrounded by a resistant fibrous capsule the two forming a single dark gray unit in which the catgut could not be distinguished from the newly formed tissue. In 2 animals in which

a longitudinal incision had been made, the artery was healed without a sign of thrombus. In the other 8 animals in which the artery had been incised transversally, the vessel was strongly retracted and its lumen was obliterated by a thrombus which extended above to the origin of the first collateral branch. Histological examination showed the formation of cells of embryonic type around the arterial wall a few days after the intervention and an obstructing thrombus in the lumen. Later there was organization and canalization of the thrombus.

The only advantage of the plastic repair seems to be that it allows more or less slow obliteration of the vessel and gradual installation of the collateral circulation. Late canalization of the thrombus is of no practical importance under the circumstances. It is evident that attempts at plastic repair of wounded vessels should be abandoned and that simple suture only should be used when possible.

RICHARD KEMEL M D

Kramer D W Intermittent Venous Compression in the Treatment of Peripheral Vascular Disorders A Report on 103 Cases *Am J M Sc* 1939 197 808

With apparatus like that devised by Collens and Wilensky in 1936 the author has treated a series of 103 patients with peripheral vascular disorders and the results are reported herewith. The pressure employed varied from 40 to 80 mm of mercury. The pressure for best results was in the higher ranges i.e. about 80 mm of mercury. Treatments varied from one to two hours daily or longer. A total of about 1,500 treatments were given. The usual run of vascular disorders were included, except the vaso neuroses and Raynaud's disease groups.

Twenty four diabetic patients were treated. Prior to treatment they complained of symptoms indicating an impaired peripheral circulation, which condition was confirmed by circulatory function tests. Twenty one patients with Buerger's disease received treatment. The results attained in patients who had Buerger's disease and diabetes were average, 66.6 per cent being benefited. In the arteriosclerotic group 15 patients were treated. The results in this group were disappointing, favorable results being obtained in only 60 per cent.

Thirty three patients suffering from phlebitis received treatment. In these the disease ranged from the acute and migrating forms of infectious phlebitis to the subacute and chronic type. Vasospasm was a common occurrence in these cases. The analysis showed that 72.8 per cent were favorably influenced.

The best results of periodic venous occlusion upon the symptoms presented were obtained in the relief of fatigue, 71 of 83 patients admitting improvement. Of 65 patients suffering from cramps, 59 reported a decided improvement, while 62 of 87 who had pain were relieved by the intermittent venous compression.

In view of the difficulties encountered in the usual treatment of phlebitis the large number of those in

this group who were benefited was considered gratifying. The author attributes the favorable results to (1) the frequency of vasospasm associated with the phlebitis and (2) the combined therapy which was given to a majority of these patients.

The precautions that should be observed in treating phlebitis are emphasized. Collectively 70 of the 103 patients in the series were benefited. Because of the favorable influence of intermittent venous compression upon various vascular disturbances and because of its broader application the author considers this procedure a desirable addition and adjunct in the treatment of peripheral vascular diseases.

HERBERT F. THURSTON, M.D.

Paine J. R. and Levitt G. The Treatment of Thrombophlebitis of the Deep Veins of the Lower Extremities with Intermittent Venous Occlusion. *Surgery* 1939 5: 97.

The authors report in detail a series of 11 cases of thrombophlebitis of the lower extremities which were treated with intermittent venous occlusion. This was produced by wrapping a rubber bag 6 in. wide and 24 in. long around the mid thigh. The bag was then inflated with air up to 80 mm. of mercury for two minutes. This period of inflation was followed by deflation for a period of equal length during which a slight negative pressure was maintained within the rubber bag. In this manner a four minute cycle was developed. The immediate result in 11 unselected cases is summarized.

In each of the reported cases the pain, discomfort and tenderness present at the onset of treatment in the affected extremity were relieved during the course of treatment. The effect of intermittent venous occlusion on the edema present and its secondary effects such as induration and stiffness of joints was variable and unpredictable. In some patients the edema was unquestionably decreased a great deal; in others the condition improved somewhat and in still others it was unaffected. If improvement did occur a certain sequel of events occurred characteristically: induration if present decreased first; the skin and subcutaneous tissues became softer and more pliable; and the subjective stiffness of the joints improved as the induration decreased.

In conclusion the writers discuss certain problems in the treatment of thrombophlebitis.

HERBERT F. THURSTON, M.D.

Mason J. M. Traumatic Arteriovenous Aneurysms of the Great Vessels of the Neck. *Ann Surg* 1939 109: 735.

The author notes that injuries to the great vessels of the neck always present problems of interest and gravity. The anatomical relations of the vessels are important. Pressure from hematomas or from expanding aneurysmal tumors may interfere with physiological function and accidents during an operative attack may be followed by disastrous consequences.

Seven cases of traumatic arteriovenous aneurysms involving the great vessels of the neck are reported. All resulted from gunshot or stab wounds. Two of the patients refused operation and 4 were operated upon: 1 by multiple ligation and excision of the fistula and 3 by transvenous arteriorrhaphy.

Arteriovenous communications between vessels of large caliber cause serious cardiac degeneration if the condition remains uncorrected for a long period. The main damage to the heart results from the quick shunting of large quantities of arterial blood directly into the vein and thence to the heart.

It has been very well established that the larger the vessels are and the closer the fistula to the heart the more rapid and severe will be the degenerative effect upon the heart muscle. The writers note when a large number of reports are reviewed that there has been great variation in the time of appearance as well as in the rapidity of the progress of these degenerative heart changes.

Some of the variations in time of appearance as well as in the rapidity of heart changes may be explained by the principle that cardiac dilatation will be prevented, delayed or arrested for a time if the free flow of arterial blood into the vena cava is interfered with either by accidental thrombosis or intentional ligation of the vein proximal to the fistula.

Some writers found that in some instances of arteriovenous aneurysm experimentally produced cardiac lesions failed to develop either early or late. This failure was attributed to the formation of a thrombus in the vein proximal to the fistula. Or ganization of the clot prevented reflux of the blood toward the vena cava and dilatation of the right heart did not occur. Matas has commented favorably upon the possibilities of proximal ligation of the vein alone in severe decompensation to stop the strain on the heart and permit a more complete operation at a later date when the collateral circulation is fully established.

The writer gives an extended discussion of the technique of operation on the blood vessels in this location with emphasis on some of the difficulties that might be encountered because of the anatomical relationships which make ligation and excision in some instances quite difficult. Although transvenous arteriorrhaphy is often followed by thrombosis with occlusion of the lumen of the vessel in the 3 instances reported by the writer the peripheral circulation was well preserved. This is a less formidable operation than excision and might be safely employed in selected cases.

In the discussion that followed Reid emphasized two points made by the writer. The first of these was the importance of bearing in mind that gunshot or stab wounds may produce more than one fistula. The most common occurrence of more than one fistula takes place in situations where a large artery is accompanied by two parallel veins in such instances the injury may puncture both veins and artery and establish arteriovenous fistulas at the points of entrance and exit of the wound in the

artery The other point was that the mere size of the fistula cannot be regarded as a definite index of the amount of damage which will be done to the heart The final test is how much actual increase in the cardiac output of blood is caused by the fistula

HERBERT I. THURSTON M.D.

#### Polony and Reboul Arterlectomy (Arterectomie)

*Mém l'Acad de chir* Par 1939 65 928

Bazy presents a report from Polony of 3 cases of arteritis and obliteration of the superficial femoral artery, without gangrene or cyanosis of the extremity but with pain and pallor of the extremity The collateral circulation in these cases was evidently sufficient The operation in each case consisted of a resection of from 10 to 12 cm. of the superficial femoral artery which was found to be obliterated almost from its origin to Hunter's canal In each case the patient made a good recovery and was able to return to work there was no pain but a sense of heaviness in the limb persisted

Bazy also presented a report of a case treated by operation by his colleague, Reboul, in which there was a bilateral arteritis of the femoral arteries with severe pain in both legs and gangrene of the toes on the right side Arteriography on the right side showed the femoral artery to be obstructed to the upper third without sufficient collateral circulation an amputation at the hip was done, which resulted in improvement of the patient's general condition When the amputation wound had healed intense pain and ulceration of the toes developed on the left side arteriography showed obliteration of the lower third of the femoral artery and of the popliteal and tibial arteries a partial arterial resection was done of the obliterated segment from the upper limit of the obliteration to the lower part of Hunter's canal This resulted in immediate relief of the pain and rapid healing of the ulcerated area More than four years later symptoms recurred, arteriography showed complete obliteration of the femoral artery resection of the superficial femoral artery from the upper limit of the obliteration to the site of the previous resection of the femoral artery was followed by immediate relief of pain and healing of the ulcerated area

On the basis of these reports the possible methods of treatment of obliterating arteritis in the lower extremities are discussed Anesthesia of the lumbar sympathetic nerves by intra arterial or peri arterial injection of novocaine may give much relief in some cases, and is useful also as an indication of the degree of vasodilatation that can be produced in the region involved Arterectomy should be reserved for those cases in which the artery can be easily exposed and resected without injury to the surrounding muscles which would destroy the collateral circulation While theoretically the entire obliterated arterial segment should be resected this can rarely be done successfully, and in practice partial arterectomy, if it includes the upper portion of the obliterated segment, often gives good results Arteriography is

necessary to locate the extent of the obliteration correctly If arterectomy fails and the interruption of the lumbar sympathetic nerves by novocaine has given definite, though temporary, relief, lumbar sympathectomy may be done Such methods should be tried in most cases before amputation is done

ALICE M. MEYERS

#### BLOOD, TRANSFUSION

Vaughan S. L. and Wright F. Purpura Hemorrhagica *J Am Med Ass* 1939 112 2120

Six cases of purpura hemorrhagica are reported in which the period of postoperative observation varied from ten to fifteen and one half years In 4 of the cases the diagnosis was definitely "recurring idiopathic purpura hemorrhagica" Recovery in these 4 cases was characteristic and permanent One of the 2 other cases was atypical in so far as the age of the patient at the onset of illness, and the short duration of the leucocyte picture was concerned, and the other in so far as the purpura was juvenile and of short duration If the second case had been treated conservatively the end result may or may not have been different The authors believe that the therapeutic indications in juvenile purpura are unsettled and that prompt splenectomy is indicated before the patient becomes a poor risk

A sharp rise in the platelet count was noted usually within forty eight hours, and it reached a peak in about ten days This was followed by a secondary fall, sometimes to a subnormal level at which point a mild recurrence of bleeding was noted This phenomenon was not present in all cases In a number of cases the platelet level remained subnormal for months or years and yet no recurrence of bleeding resulted

Two of the 6 cases in this series showed postoperative pulmonary complications one having pain and friction rub, and the other a large effusion

Four of the 6 patients are known to show normal platelet levels at present

RICHARD J. BENNETT JR. M.D.

Dekkers H. J. N. The Fate of the Transfused Red Blood Cells *Acta med Scand* 1939 99 587

The author reviews the literature concerning the life of the red blood cell and finds that with the indirect methods of examination available the reports vary from fifteen to two hundred days and depend on the author and the method employed

The fate of the transfused red blood cell has been in doubt and has been the subject of much speculation According to the literature estimations of the hemoglobin, the erythrocyte count and metabolism experiments the life may be none to three weeks The use of the differential agglutination method of Ashby in which Group O donors were used and the recipients' cells subsequently agglutinated with A or B serum gave indirect evidence that the cells might live from a few to one hundred days but this was open to considerable error

Dekkers using the hetero agglutination factors M and N described by Landsteiner and Levine in 1929 made direct determinations in 23 patients on the longevity of the transfused red blood cells. For example patients of Group A possessing the M factor were transfused with Group A blood containing the N factor. The transfused red blood cells could then be detected by treating samples of the recipient's blood taken at varying intervals following the transfusion with a specific anti serum for the donor's cells (anti N in the example given above). No individuals containing both M and N factors could be used and no universal donors were used.

Indirect sodium citrate transfusions were used. Samples of blood collected from the recipient were mixed with the appropriate specific anti serum and agglutination was observed. Microscopic readings were found to show agglutination over a longer period than macroscopic readings which were also used. Donor cells in the recipient were thus detected as early as after only 30 c cm of blood had been given. The life of the cells transfused varied in 13 of these cases from nineteen days (macroscopic) and twenty three days (microscopic) to sixty eight days (macroscopic) and ninety five days (microscopic) the average being fifty four and one half days (macroscopic) and seventy five and one half days (microscopic).

As the donor cells gradually disappear the dilution factor produces some error. This may account for the finding that the larger the mass of blood given the longer the cells are detected. The case showing the nineteen day survival was one of hemolytic anemia and the findings in it corresponded to the incomplete findings in another similar case and the author believes this was due to the increased rapidity of destruction of red cells in this disease.

No differences in the life of the transfused red blood cells were noted in cases in which reactions occurred (none had hemolytic reactions). No sensitization to a hetero agglutination factor was noted in the only patient who had as many as five transfusions. This is believed by some to account for the repeated transfusion reactions in those who have had many transfusions. THOMAS C DOUGLASS M D

Kolmer J A. Preserved Citrated Blood Banks in Relation to Transfusion in the Treatment of Disease with Special Reference to the Immunological Aspects. *Am J M Sc* 1939 197 442

Fourteen c cm of a sterile 2.5 per cent solution of sodium citrate may be added to 100 c cm of blood for preservation in banks at from 4 to 6 C and made available after typing and serological tests for transfusions for from ten days to several weeks.

Sepsis has been treated by transfusions because of secondary anemia. The author believes the immunological properties should receive some emphasis as an additional value.

Investigations of the complement in stored blood show that the complement disappears in five days

in uncitrated blood whereas blood stored with 0.35 per cent of citrate contains active complement for two or three weeks. Strong solutions of 5 per cent citrate were shown to be destructive to the complement.

Bactericidal properties of blood were not affected in blood stored from one to three weeks, but then these properties were found to be decreased. Citrated bloods lost their phagocytic activity in from seventy two hours to five days after which no phagocytosis was observed.

A study of the cellular elements of preserved blood showed that the erythrocytes began to disintegrate in forty eight hours and that in fourteen days 30 per cent of them were shadows with marked loss of hemoglobin. Twenty four hours after collection the leucocytes began to disintegrate and become reduced in number. In forty eight hours there were marked chromatic changes and the cytoplasm became basophilic. In fourteen days there was complete destruction of the cytoplasm. Platelets showed immediate clumping and deterioration occurred in twenty four hours. Hemolysis was noted to begin in five days and was progressive thereafter.

The author believes that fresh citrated blood is just as applicable as whole blood to direct transfusion but that the former causes more minor reactions.

The author's findings would indicate that blood which is preserved beyond two or three days is of dubious value in anemias, purpuras and septicemias. For this reason it is recommended that preserved blood be used only for the restoration of the blood volume in acute hemorrhage and shock.

THOMAS C DOUGLASS M D

Scudder J, Drew G R, Corcoran D R and Bull D C. Blood Preservation. Retention of Potassium in Cells and Plasma. *J Am M Ass* 1939 112 2263

It has been known for some time that serum left in contact with red blood cells shows an increase in potassium content at the expense of the cells which normally have as much as twenty times the potassium content of the plasma. By storing blood under aseptic conditions the authors found that the blood serum of 100 c cm of blood contains 50 mgm of potassium at the end of the first week and 75 mgm after two weeks of storage whether an anti coagulant is used or not. There are daily increments up to 1000 per cent in the plasma potassium. None of the usual anti coagulants affected the rate of the diffusion of potassium from the cells. In one experiment heparin showed a marked effect in slowing this liberation but further investigation showed that this phenomenon was due to the small container used and that when a larger container was used there was little difference in effect between heparin and sodium citrate. Diffusion of potassium was much more rapid in blood vigorously shaken.

A comparative study was made of the various anti coagulants. 2.5 per cent sodium citrate (70



c cm per 500 c cm of blood) 3 per cent sodium citrate (60 c cm per 500 c cm of blood) the Russian citrate compound (sodium chloride, sodium citrate potassium chloride magnesium sulphate, and distilled water) and the Peyton Rous compound (250 c cm in a 5.4 per cent solution of dextrose and 100 c cm in a 3.8 per cent solution of sodium citrate, added to 150 c cm of blood) The simple citrate solution was found to produce the slowest diffusion of potassium The diffusion of potassium was found not to correspond to the rate of hemolysis which was noted in the trials of all the anti coagulants except the Peyton Rous compound which is not practical for transfusion because of its high citrate concentration

It is generally agreed that small doses of potassium increase while large ones weaken and paralyze the normal functions of the nervous glandular and muscular systems The intravenous injection of potassium chloride solution was found to be fatal to rabbits and dogs The rate of injection is very important since several times the lethal dose may be injected, if it is given slowly without a fatal outcome From their animal experiments, the authors believe that the rapid transfusion of from 3 to 5 liters of blood containing 100 mgm of potassium per 100 c cm of blood (the blood having been stored for about thirty days) would be necessary to kill an adult human being Toxic manifestations probably occur following the administration of much smaller quantities

The use of stored blood would then be contra indicated in conditions associated with a hyperpotassemia i.e. the dehydration of cholera, intestinal obstruction intestinal fistula severe burns, and renal and hepatic insufficiency It is also contra indicated in diseases such as typhoid, influenza, and pneumonia which manifest a potassium retention Certain metabolic diseases, such as parathyroid tetany and Addisonian crises would also constitute a contraindication to the use of stored blood

The authors believe that the increased potassium content is only one of the undesirable features of preserved blood and they are making other investigations They point out that the finding of an anti coagulant which would prevent the diffusion of potassium and hemoglobin from the cell would

make preserved blood a great deal more desirable  
THOMAS C DOUGLASS, M D

## RETICULO ENDOTHELIAL SYSTEM

Arons I and Sokoloff B The Role of the Reticulo Endothelial System in Cancer With Reference to Congo Red Therapy in Roentgen Sickness and Anemia *Am J Roentgenol* 1939 41 834

In the struggle of the organism against infection and malignant disease much depends upon the readiness of the reticulo endothelial system to respond This system is generally regarded as being especially concerned with the defense of the body against living and non living toxic agents whether by the process of antitoxin formation or by phagocytosis The last term was first introduced by Aschoff in 1924, as a name of the function of a system of cells distributed throughout the body and especially demonstrated by methods of intra vitam staining By these cells we mean the reticular tissue in general, and the phagocytic cells of the spleen pulp, bone, marrow lymph glands and Kupffer cells of the liver, in particular

The authors summarize their experience as follows

The resistance against transplantable tumors, as well as against malignant disease in general depends on the state of the reticulo-endothelial system By the blocking of this system, the resistance might be broken down The reticulo endothelial system may be stimulated by means of small doses of roentgen irradiation, or by a small dosage of electronegative vital dye, such as Congo red

It was furthermore demonstrated that Congo red seems to be a powerful hemostatic agent, which is due to its specific action upon the cells of the reticulo endothelial system In toxic hemorrhage, intravenously injected, Congo red may stop the bleeding almost immediately Its practical value in roentgen therapy is discussed An analysis of 70 cases treated with Congo red suggests its application in roentgen sickness and anemia The reticulo endothelial system of the adrenal glands has been studied It was noted that the V zone of the reticularis reacts to growth of transplanted tumors as well as to the injection of estrin

PAUL McFRELLE M D

# SURGICAL TECHNIQUE

## OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Brumm H J and Willis F A The Surgical Risk in Coronary Disease *J Am M Soc* 1939 112 2377

The material of Brumm and Willis comprised 257 cases of severe coronary disease representing coronary atherosclerosis with the anginal syndrome and cases with healed cardiac infarcts with or without recurrent angina. Forty seven patients were subjected to operations on the gall bladder and biliary passages 18 to surgical procedures on the stomach and duodenum 13 to interventions on the intestines and rectum and 26 to urological operations exclusive of transurethral resection. Sixty three patients underwent the transurethral procedure. Ten patients were subjected to operations on the breast 12 to gynecological surgical procedures 42 to thyroidectomy 8 to miscellaneous abdominal operations not included in other classifications relative to the abdomen and 18 to various surgical interventions which did not fall in any of the previously named classes. Minor operative procedures were not included.

As one would anticipate the majority of the patients were found to be grouped in the later years of life. One hundred and forty eight patients (57.6 per cent) were sixty years of age or older. The youngest patient was thirty five years of age the oldest eighty three years and the average age of the entire group was sixty and three tenths years. There were 196 males and 71 females a ratio of 2.6 to 1. The pre dominance of males correspond to the increased prevalence of coronary disease in that sex.

Approximately half (50.4 per cent) of the cases exhibited electrocardiograms revealing important abnormalities which included significant T wave negativity incomplete and complete bundle branch block complete heart block and auricular fibrillation. Previous coronary thrombosis with healed cardiac infarction had occurred in 32 cases (12.4 per cent). Well marked hypertension was noted in 100 cases (38.9 per cent).

Many instances of less severe coronary atherosclerosis were excluded as not representing surgical hazards. However all patients with severe coronary disease associated with surgical conditions observed at the Mayo Clinic were not subjected to operation although in extreme emergencies some were accepted. Such cases comprised recent coronary thrombosis those displaying the status anginosus congestive heart failure cases of Stokes Adams seizures and those with episodes of nocturnal dyspnea or cardiac asthma.

Only 11 (4.3 per cent) cardiac deaths occurred. In case 1 the symptoms resulting from a diaphragmatic hernia fully justified the anticipated risk of

repair. In case 2 in which partial gastrectomy and duodenostomy were performed for multiple hemorrhagic duodenal ulcers with obstruction the patient had such a marked degree of incapacity and discomfort that he insisted upon accepting the hazards of surgical intervention. In case 3 in which carcinoma of the urinary bladder existed the only reasonable chance for cure was in operation. In cases 4 5 and 6 thyroidectomy seemed clearly indicated because of either hyperthyroidism or substernal adenomatous goiter with obstruction. In cases 7 and 8 severe recurrent biliary colics resulting from cholelithiasis and chronic cholecystitis clearly justified operation. In case 9 the presence of carcinoma of the sigmoid predicted either death from carcinoma or possible cure from resection. Cases 10 and 11 both represented intractable cases of the anginal syndrome coming under observation during those years when resection of nerve structure seemed to be a justifiable procedure for that disease.

Seven deaths were attributable to coronary thrombosis with acute cardiac infarction and 2 to congestive heart failure and in 2 cases death occurred abruptly and apparently without thrombotic occlusion. It is interesting and important to note that the average age of the patients dying from cardiac causes was sixty and seven tenths years (excluding the patient aged thirty seven years this relatively young man being an exception).

The cardiac mortality in the group of cases presented in this study is remarkably low and should encourage the sufferers from coronary disease when surgical intervention is necessary. However it must not instill false optimism into the clinician or the surgeon for they must realize that this accomplishment is not of casual origin but one resulting from the co-ordination of careful pre-operative study and judicious selection the expert administration of anesthetic agents and skillful surgical technique and judgment. Operation must be confined to those cases presenting unmistakable indications and the procedure limited to the primary condition. Surgical procedures that are not urgent have no place in the cases under discussion.

Brown J B The Utilization of the Temporal Muscle and Fascia in Facial Paralysis *Ann Surg* 1939 109 1016

The temporal muscle and fascia can be utilized to give anchorage for fascial strips in facial paralysis when nerve anastomosis is impossible and some degree of emotional expression may be developed.

Three or more very long strips of fascia lata about 1 cm wide are removed with the Masson or other suitable stripper. (The diagrammatic course of the fascial strips is shown in Figure 1.) A slightly curved incision about 6 cm long is made in the hair bearing temporal region and the temporal fascia is exposed

by retraction. With a long needle a loop of fascia is threaded from this wound through the subcutaneous tissues of the face out through a stab hole in the philtrum and back up through a second different channel into the temporal wound again. A second loop is put in with an extra curve around the angle of the mouth. In heavily drooped faces, other loops to the ala and farther across under the lower lip may be necessary.

One strand of each loop is carried through the temporal fascia near the coronoid all the way down through the muscle and out again through the fascia from 1 to 2 cm distant. The loops are then pulled tight to overcorrect the face. Fixation is firmly effected with three or four No. 000 silk sutures through the loops (Fig. 2). The skin flap is closed and excess skin may be excised along the margin after the anterior flap is pulled up tightly but badly drooped cheeks in patients with thick skin and subcutaneous tissue may need to have the excess skin removed at a second operation because healing may be delayed. The needles used are the hollow tube type used by Blair and one of the heavy full curved fascial type for putting the loops into the muscle. Tendon transplants do not stand infection so every effort should be made for a clean operation. Intra tracheal anesthesia is probably the best. A large

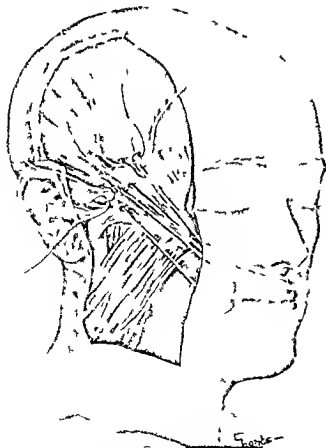


Fig. 1 Diagram of the free fascial loops' course through the face and fixation in the temporal muscle



Fig. 2 A Complete facial paralysis congenital B Result of the described operation showing motor power of the (fifth nerve) temporal muscle elevating the lip in a slight smile to give some degree of emotional expression C and D Later photographs to show persistence of result and also improvement in control of the face and in emotional expression (Courtesy of the J. B. Lippincott Co)

pressure dressing is put over the entire side of the face. Chewing is prohibited. After several days the face can be supported with collodion and fine mesh gauze for two or three weeks.

For a successful outcome, the patient should train his facial movements. This includes the use of the newly attached fifth nerve muscle to produce a slight smile and a nasolabial fold. Of equal importance is learning not to overact on the sound side. If there are speech defects professional training should be of great value.

Some elevation of the sagged lower lid is obtained by the operation on the face but if not sufficient a single fascial loop can be put through the lid and held on each end, above in the opposite frontalis and on the outside in the temporal fascia. Heavy drooping brows may be raised by extension of the skin incision over the forehead and excision of the excess skin. For the apparent exophthalmos a small external canthoplasty can be performed. The use of fifth nerve muscles is not recommended in the attempt to elevate the upper lid because the movements appear too gross. BRADFORD CANNON, M.D.

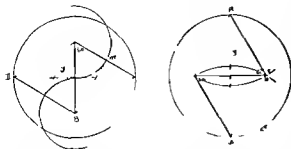


Fig 2 The geometrical and mathematical transposition of the triangular flaps outlined by the Z (Courtesy of J B Lippincott Co)

grafting can be permanently relieved by this method. The results are so satisfactory that Z plastic operations are used more and more for the shifting of triangular flaps of scar infiltrated tissues and of normal tissues when available in all parts of the body.

In making the Z incision it is important to understand that instead of one being able to select any angle desired in making the Z transposing the triangular flaps and closing the wound there are practical limitations which preclude the use of a wide range of angles. For simplicity the authors have drawn figures with the sides of the Zs of equal length (Fig 1). The legends explain the phases of the transposition of triangular flaps. A Z-shaped figure is drawn with the central and arm lines of equal length. The arm lines are laid down from either end of the central line on opposite sides and are parallel to each other. If the figure is completed by lines across the bases of the two triangles out lined by the Z a parallelogram is formed. The principle upon which the shifting of triangular flaps is based can most readily be understood if the two flaps are considered as the triangles which form this parallelogram (Fig 2). The line of incision along the central line of the Z is the short diagonal and an imaginary line joining the outer ends of the arm incisions of the Z is the long diagonal of the parallelogram. The transposition of the triangular flaps interchanges the position of the diagonals. The difference between the lengths of the two diagonals is the amount of relaxation secured.

The important factor in the theoretical and practical application of this method is the size of the angles which are made by the arm lines in relation to the central line of the Z. In actual practice because of the limited elasticity of the scar infiltrated skin the thickness of the flaps essential to viability the location of the body and the theoretical limitations the Z should be cut with angles not larger than 60 and not less than 20. The authors have found that the 60 angle is usually the one of choice.

Scar contractures with bridle or webs usually follow the healing of extensive burns or tissue losses and often develop in spite of careful and up to date

methods of treatment. They are most frequently found in the axilla where the extremities join the trunk in the neighborhood of joints on the hands and feet in the mouth and on the face and neck.

It is advisable to delay operative work in contracted scars for at least six months after healing has taken place and often longer until nature assisted by physical therapy has had time to do all that she can and will.

Avertin supplemented by nitrous oxide and oxygen is the anesthetic advised. One must be careful in the pre operative preparation not to use any material that may cause subsequent blistering of the scar.

The operative technique is described in detail as follows.

With the scar bridle under tension the proposed incisions are marked out with 5 per cent brilliant green in alcohol. The central line of the Z is marked along the most prominent part of the bridle or web and the arms of the Z which are of the same length as the central line are laid out on opposite sides of the central line the pattern making a typical or reversed Z according to the condition of the surrounding tissues. The arms of the Z being at each end of the central line on opposite sides are drawn parallel to each other at about a 60 angle to the central line as this has been found to be the most satisfactory angle for practical use.

Marking out the Z with the 60 angle can be facilitated by having among the instruments a piece of thin metal cut out with this angle and having its edges marked with inches or centimeters so that the lines of the Z which should be equal, can be easily measured.

If unequal angles are used the arm lines cannot be parallel to each other. When incisions are made following the Z pattern two broad based triangular flaps result with bases that are opposite to each other. These flaps are undercut and fully mobilized and all binding scar tissue beneath is removed as completely as possible. When this is done the ends of the central incision are drawn away from each other by scar pull the central line becomes longer and the angles become blunted. The flaps are then transposed so that their outer margins approximate and the tips of the flaps touch the outer corners of the bases of the opposite flaps. The flaps are then sutured without tension into their new positions with a few on end mattress sutures of fine black waxed silk placed at strategic points and the rest of the closure is made with similar sutures of horse hair. The sutured wound is also Z shaped but the Z is turned approximately 90 is elongated and the central line now lies transversely across the scar pull. The elongation is the relaxation obtained by the shifting of the flaps and this gain in length depends on the size of the Z and on the size of the angles at which the arm lines are cut in relation to the central line.

When the angles are unequal lines projected across the bases of the triangles outlined by the Z

will form a rhomboid. The central line of the Z in these figures is also the short diagonal and the line joining the ends of the arm lines is the long diagonal. The amount of relaxation obtained is the difference between the lengths of the long and short diagonals of the parallelogram, or of the rhomboid as the case may be.

Dressings consist of a single thickness of gauze impregnated with 3 per cent xeroform ointment over which are placed several thicknesses of dry gauze and a sterile sponge wrung out thoroughly. Even pressure is applied with adhesive plaster and a bandage and the part is immobilized. Sutures are removed as they become loosened after the third or fourth day, they should all be out by the tenth day. Massage is started after three weeks and is continued for several months.

Illustrative cases are presented and many further details of the procedure are discussed.

SAMUEL H. KLEIN, M.D.

#### ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

**Ramon G.** New Methods of Combating Tetanus. Sero-vaccination. Sero Anatoxin Therapy. Prophylaxis with Antitoxin (Sur de nouvelles méthodes de lutte contre le tétanos: séro vaccination séro anatoxithérapie: prévention au moyen des solutions d'antitoxine tétanique). *Presse méd.* Par 1939 47 98r.

*Serovaccination against tetanus.* Vaccination with the tetanus anatoxin is in the author's opinion, the method of choice in protecting the individual against tetanus. However in an emergency in a non vaccinated person serotherapy is the method of choice. The latter has its limitations: it is of short duration if the patient has previously received one or more such injections, the antitoxin is eliminated more rapidly from the system and such elimination may be followed by the late postserum tetanus described during the war by Bazy, Lenormant, Maurice and others. Sorrel has reported a fatal case of tetanus which occurred eighteen days after the administration of serum which was given immediately after the accident. To avoid such mishaps it seemed desirable to administer specific anatoxin as well as the antitoxic serum, so that an active immunity could develop in the meantime. This method was first used successfully in man by Ramon and Zoeller in 1927. After reviewing the literature on the subject the author concludes that serotherapy combined with specific anatoxin vaccination induces an active, durable immunity.

It is advisable, therefore whenever possible, to use serotherapy combined with vaccination in wounded individuals not previously vaccinated in order to continue the passive immunity with an active immunity. The technique of serovaccination is as follows:

The first subcutaneous injection of the anatoxin (1 c cm) is given shortly before the serum is ad-

ministered. Fifteen days later a second injection (2 c cm) of anatoxin is given, and fifteen days thereafter the third injection (2 c cm) of anatoxin is administered. If such an individual subsequently becomes injured he is given anatoxin instead of the usual antitetanic serum.

*Serum antitoxin treatment of actual tetanus.* Ramon with Kounilsky and Richou in 1938 introduced this method of treatment. A massive dose of antitoxin (150 000 units) and at the same time a 2 c cm dose of anatoxin are given. Anatoxin is then given in progressively increasing doses every five or six days (2, 4, 6 c cm). This diminishes the amount of serum necessary to maintain the state of immunity. The active immunity thus induced also prevents the late development of tetanus from residual tetanus spores usually occurring in such wounds.

*Obtaining antitetanic serum of high antitoxic value.* The use of anatoxin together with other substances, particularly tapioca, has made it possible to obtain hyperimmune serum from horses in a shorter interval of time than hitherto. Thus, after one month of injections the horse serum titer is raised to 4,000 antitoxin units per cubic centimeter. This is particularly important in sera destined for therapeutic purposes. Furthermore, these hyperimmune sera may be utilized to make solutions of the antitoxin in physiological saline solution which dilutes the amount of equine proteins administered and prevents the incidence and severity of serum reactions so well known in the use of the ordinary serum. No serum reactions were noted in 100 individuals who received this antitoxin solution of 3 000 units to 10 c cm strength. A physician required antitetanic serum for a wound he had incurred. On previous occasions he had suffered from severe serum reactions after the usual antitetanic serum. The solution of antitoxin did not provoke any reaction whatever in this allergic individual. JACOB E. KLEIN, M.D.

**Ramon G.** Tetanus Anatoxin and the Prophylaxis of Tetanus in Man and in Domestic Animals (L'anatoxine tétanique et la prophylaxie du tétanos chez l'homme et chez les animaux domestiques). *Presse méd.* Par 1939 47 87r.

Reviewing the work done with tetanus anatoxin, Ramon shows that it has been found that if three injections of tetanus anatoxin are given at intervals of a week or more, the antitoxin titer of the blood is increased to a level where the subject is definitely protected against tetanus if a stimulating dose (injection "de rappel") is given at a later period, the antitoxin titer is still further increased, and this increase is maintained. The results from the use of tetanus anatoxin obtained by Ramon and his associates have been confirmed by other investigators in France and other countries.

It has been found that when a person who has been vaccinated against tetanus with tetanus anatoxin has an injury from which there is danger of tetanus a single additional (stimulating) injection of the anatoxin is sufficient to increase the antitoxin

of the blood and protect against tetanus. With this method the danger of serum reaction is avoided. If there is any doubt as to the method of the previous vaccination or if there are multiple wounds and severe hemorrhage it is best to give an injection of antitoxin in addition to the anatoxin.

Vaccination with tetanus anatoxin is indicated chiefly for individuals and for groups who are especially exposed to tetanus infection. The active immunity obtained by this method protects against subsequent infection with tetanus either through an open wound or the more insignificant injuries which are not recognized as dangerous and for which serum is not given. The value of tetanus vaccination is increased by the fact that it may be combined with other antitoxins (or anatoxins) or vaccines, especially with diphtheria anatoxin and typhoid vaccine, both of which are widely used. This method of combined vaccination has been used in the French army for several years and is being adopted by other armies.

The protection of domestic animals and particularly horses against tetanus has also been carried out in France by the injection of tetanus anatoxin to which tapioa is added. In the French army where this method has been used for ten years tetanus no longer occurs in horses.

ALICE M. MEYER

Barnes M. N. and Bibby B. G. A Summary of Reports and a Bacteriological Study of Infections Caused by Human Tooth Wounds. *J. Am. Dent. Ass.* 1939 26 1163

The authors have reviewed all of the literature on human tooth wounds and the infection resulting from them. A total of 341 cases of human bite infections are reported, and in most of the serious infections the clinical course was found to be remarkably constant. There was more variance in the bacteriological aspects of the bite infection. Bacteriological studies were made in 33 of the 341 collected cases. The usual aerobic culture revealed the presence of streptococci and staphylococci of different types and gram positive bacilli were frequently recovered. In the anaerobic cultures fusiform bacilli and gram positive cocci were uniformly present.

The authors were able to carry out careful bacteriological studies in a case of fatal human bite infection which followed an essentially typical course. In the cultural studies methods which had been employed in previous work were followed. Smears of the pus showed gram positive cocci predominantly aerobic cultures showed only gram positive cocci which resembled atypical staphylococci. Anaerobic cultures showed a variety of organisms such as gram positive cocci and bacilli and gram negative cocci and bacilli and these resembled types which had previously been isolated from the mouth by the authors. Blood culture revealed upon anaerobic growth only gram positive cocci which appeared the last few days before death.

The irregular occurrence of different organisms in aerobic cultures from the pus suggests that such

types had little etiological significance. However in view of the constant appearance of several anaerobic coccal types and the repeated isolation of a coccus in anaerobic cultures from the blood stream a special significance attaches itself to these types.

The authors list the cultural characteristics of these persistently appearing pus cocci and give a summary of the biochemical properties of the blood coccus. They conclude that in human bite infections mouth organisms such as the anaerobic cocci together with other types may give rise to the suppurative processes which cause serious tissue destruction, septicemia and possibly even death.

HARVEY S. ALLEN, M.D.

McMaster P. E. Human Bite Infections. *Am. J. Surg.* 1939 45 60

This article reports a series of 68 human bite infections. Thirty eight of the cases were the result of fight injuries in which the hand was cut by the teeth and the remaining cases were the result of wounds directly inflicted by human beings biting others. The usual clinical course is described.

Cases are rarely seen soon after the injury. In 3 instances seen within the first few hours the treatment was cauterization, the wounds were left open and the dressings moistened with hydrogen peroxide. All healed without complication.

The avulsive bite cases in which a segment of skin was bitten away did not offer difficulty in treatment or complications.

The severely infected wounds of several days or weeks duration were opened widely and necrotic tissue was excised. They were then compressed with oxidizing agents such as hydrogen peroxide or sodium perborate powder. The patients treated with oxidizing agents seemed to heal more rapidly than those treated with basic or magnesium sulfate packs. Neosarsphenamine given intravenously did not influence the course of the infection. Despite excision of the necrotic tissue and the oxidizing agents almost half of the patients in this series were confined to the hospital for two weeks or more.

Smears and cultures were made of 41 cases. Ten smears showed both the fusiform bacillus and the spirochete of Vincent while 12 yielded only the fusiform bacillus. The remaining 20 cases revealed a mixture of diphtheroid bacteria, staphylococci and streptococci. Five cultures were negative and the majority yielded the staphylococcus aureus and a few the streptococcus viridans and streptococcus hemolyticus.

The complications depended on the location of the wound and the time that treatment was begun. The more severe complications followed the fight wounds; they were cellulitis, lymphangitis and abscess or necrosis of the tendons. In 17 cases suppurative arthritis was present and associated with osteomyelitis of the adjacent bones.

Amputations were done in 9 cases after the infection cleared in 2. Seven were done because of extensive soft tissue and bone necrosis and in 2 of these

continued spreading infection of the hand required amputation through the forearm

The author describes the gross and microscopic appearance of the amputated specimens

HARVEY S ALLEN M D

### ANESTHESIA

Parini A A Report on 1 429 Anesthesias with Sodium Evipan (Considerazioni dopo 1 429 narcosi con evipan sodico) *Arch ital di chir* 1939, 56 164

Evipan, the sodium salt of N methyl C C cyclo hexamylmethyl barbituric acid, is given intravenously It combines with the albumin and globulin of the blood which transports it to the nervous system, where it has an elective action on the mesencephalon The body rapidly destroys this compound which action diminishes its concentration and the depth of the anesthesia The liver chiefly acts as the decomposing agent of evipan, the kidney has no action in this regard consequently, serious renal lesions are no contraindication to this mode of anesthesia Neutralizing agents of evipan which may be used to counteract the effects of the drug are strychnine, picrotoxin and coramine To stimulate the respiratory center lobeline and caffeine may be administered

In describing his technique of anesthesia the author states that he uses a pre anesthetic injection of 0.05 gm of morphine chloride, 0.5 mgm of atropine sulfate and 0.02 gm of sparteine sulfate one hour before the injection of evipan This calms the patient psychically leads to a regular and profound anesthesia and avoids postnarcotic excitement The evipan is injected slowly the lower jaw drops after the injection of from 3 to 4 c cm The author

describes in detail the reaction of the patient during the course of anesthesia The duration of narcosis is from ten to fifteen minutes in some cases twenty five to thirty minutes In some instances ether was given in addition The author presents a list of various operations done under the mode of anesthesia described This includes mastoidectomy thoracoplasty gastroenterostomy, cholecystectomy, appendectomy, hysterectomy, nephrectomy, hemorrhoidectomy, fracture reduction, amputation, and treatment of hernia The major operations were done with the addition of ether Evipan was found particularly suitable for eye operations

Evipan is contraindicated in patients with shock, anemia, sepsis, cachexia, peritonitis, hepatic insufficiency, diabetes and myocarditis

In 3 cases there was an arrest of the respiration at the beginning of the anesthesia Recovery was induced in 1 case by traction on the tongue and in the 2 other cases by artificial respiration and inhalations of carbon dioxide In 1 instance the arrest of respiration seemed to be due to the too early administration of the evipan after the preparatory sedative injection In the 2 other cases it was due to too rapid injection of the evipan

The author concludes that evipan is a good anesthetic with few dangers provided that its indications and contraindications are properly understood and respected He emphasizes the importance of injecting the drug very slowly and watching the patient very carefully, particularly at the beginning of the anesthesia Evipan is especially well adapted to short surgical operations in which complete muscular relaxation is not necessary

In the entire series there was no mortality, although there were a few serious reactions as described

JACOB E KLEIN M D

# PHYSICOCHEMICAL METHODS IN SURGERY

## ROENTGENOLOGY

Cardillo F. Considerations on and Experiments with Roentgenograms Taken at a Very Short Distance (Considerazioni ed esperienze sulle radiografie eseguite a brevissima distanza) *Radiol med* 1939 26 622

Cardillo applies the term of plesioroentgeography to the method of roentgenography which uses minimal focal distances. In this method adherence to the correct distance is very important as a difference of 1 or 2 cm. has a marked influence on the quality of the roentgenogram. Two facts must be taken into consideration in the study of the distance relations between the focal point of the tube, the object to be roentgenographed and the film. The first is the enlargement of the various planes of the object according to their distance from the film and from the focus: the deformation increases with the distance of the plane from the film and its nearness to the focus independently from the size of the focal spot. The second concerns the sharpness of the roentgen image which depends on a definite law as the focus is never punctiform: the roentgen image of an object must present a blurred contour and the amount of blurring depends on the size of the focal spot and on the distance relations between the focus, object and plane of the film. The author demonstrates the advantage of using minimal focal distances with a tube the focus of which can be carried within 2 or 3 cm. from the object. He has used such a tube for his experiments.

Practically in the roentgenograms obtained with this tube the planes nearest to the focus lose their distinctness through enlargement or blurring and the planes nearest to the film become clearer. The method resembles that of tomography with the understanding that instead of allowing selection of a plane it is limited to only one plane, that nearest to the film besides the degree of blurring of the various planes decreases toward the part of the body in contact with the film: the selective effect will in general not be as clear cut as in tomography.

The ideal indication for the use of plesioroentgenography will consequently be the case in which the osseous planes are sufficiently removed one from the other and are separated by tissues of slight opacity and give no roentgen contrast such as the cranial vault, the facial bones and the chin. The latter is reproduced very clearly by putting the tube on the neck: the image of the spinal column is so blurred that it does not show at all and the central part of the mandible appears with extreme clearness on the film. The ribs, the sternum (prolonged exposure through the vertebrae with consequent loss of roentgen contrast) and the patella are particularly well revealed by the method. The best results are obtained with tubes having a small focus: those with

a large focus exaggerate the blurring of all the planes whether far from or near to the film and decrease the clearness of the roentgen image. The fact that the skin receives a dose of only 35 roentgens per exposure with this tube and that a very small area (2 to 3 cm. in diameter) is struck by the rays shows the harmlessness of the method. The use of intensifying screens and rapid films is recommended.

RICHARD KEMEL, M.D.

Santagati F. Roentgen Examination in Fractures of the Cranial Vault (L'indagine radiologica nelle fratture della volta del cranio) *Radiol med* 1939 26 506

In order to determine the roentgen characteristics of fractures of the cranial vault and the probability of demonstrating these fractures Santagati has studied the skulls in the Museum of the University of Milan and numerous roentgenograms of cranial trauma kept in the archives of the Military Hospital of Milan.

In general the roentgen image of linear fractures shows a transparent straight or broken streak which may vary in width at different points from a wide band to a narrow fissure and even end in a capillary line: it is more transparent than the venous and arterial grooves and its borders are not as perfectly parallel as those of arterial grooves. To obtain the best results the fracture line must be close to the film and be struck parallel to its plane by the rays: if the fracture is away from the film its image will appear enlarged and blurred and will recall that of a diploic sinus. A double line is often produced at some point when the two fractured tables are not in the same plane or when the plane of fracture runs obliquely to the incidence of the rays: each table giving a separate image (Fig. 1). This is a pathognomonic sign. The fracture line may also be wavy. Overriding fragments are shown by lines of greater opacity than that of the surrounding bone. Fracture of one table occurs and is hard to recognize during life.

Causes of error are introduced by thickened or infiltrated borders of the wound defects in the film, arterial and venous grooves, sutures (especially supernumerary), wormian bones, projection of the fracture of one region onto another region and the step like image of the lambda in batrocephalic subjects.

The statistics of various authors show that roentgen demonstration of fracture of the cranium succeeds in only from 50 to 60 per cent of the clinically accepted cases. However a break in the continuity of the cranial walls does not necessarily correspond to a clinical diagnosis of fracture and necropsies have revealed that at times extensive fractures of the cranial vault do not show on roentgenograms. Certain conditions must be fulfilled to





Fig 1 Left temporoparietal fracture running obliquely from above downward and from behind to the front and right curved frontal fracture with horizontal fissure of the outer table. Lateral right to left exposure shows the distinct line of the temporoparietal fracture with typical double image and the enlarged blurred line of the frontal fracture.

make a fracture visible on the film, the fissure must have a macroscopically appreciable width, dense bony parts must not be superimposed on the line of fracture, and the rays must strike the fissure parallel to its own plane. Therefore special oblique exposures indicated by the individual cranial parts must be used in addition to the three classical orthogonal exposures. Even then there will still be a certain percentage of fractures which will escape roentgen demonstration under the best technical conditions. Consequently, from the medicolegal point of view, a negative roentgenogram is not always sufficient to exclude a fracture of the cranial vault, especially in the presence of evident clinical signs such as Hellner's triad. In any case, roentgen examination should be considered as an aid to clinical examination in the exact localization of the seat and extent of a fracture and the discovery of fractures which do not result in clinical symptoms, as in cases of apparently slight traumatism.

RICHARD KEMEL, M.D.

**Pfahler, G. E. *The Roentgen Diagnosis and Treatment of Carcinoma of the Larynx and Pharynx*. Radiology 1939 33: 42.**

Cancer of the larynx in its earliest stage is probably best diagnosed by direct or indirect laryngoscopy rather than with roentgen rays. Although irradiation has been used effectively in some such cases, it is generally recognized that surgery is the treatment of choice for this disease and the radiologist is rarely needed for either diagnosis or cure.

In later stages, when the disease is no longer confined to the cords, a roentgen study is absolutely necessary. It usually reveals the outline of the entire tumor and furnishes considerable information as to the condition of the surrounding tissues. Fluoroscopy as well as roentgenography are essential for obtaining all the required information. The former permits the determination of movements with phonation and swallowing and with the aid of an opaque meal, irregularities of contour and

abnormalities of the passage of such a meal may be observed, which may be of the utmost value in the diagnosis. Both sagittal and lateral observations should be made. Films are needed to bring out details of the various parts and to record observations which have been made fluoroscopically. Various special procedures which may be of value in some cases are described by the author. He lays special stress on the value of anteroposterior and posteroanterior examinations which may give valuable information not obtainable otherwise. Tomography is mentioned as being of value.

Cancer of the larynx is recognized roentgenographically by the opacity which it causes in the transparent laryngeal space. In addition to this, irregularities can be observed on the two sides of the larynx, even in an early case, by irregular filling of the valleculæ or the pyriform sinuses. Irregularities in the action because of the infiltration, fixation, and increased opacity of the tumor tissue involving the pharyngeal vestibule or the laryngeal vestibule can also be demonstrated. A tumor involving one or both of the arytenoids may cause an increase in volume, or if it is in an advanced ulcerating stage it may show destruction of one or both of the arytenoids. The disease may involve the epiglottis or the aryepiglottic folds, which would then not only interfere with the movement of the epiglottis but would also show an irregularity in outline. The space between the epiglottis and base of the tongue is normally smooth in outline, but when an ulcer or a tumor is present this outline is disturbed and can be easily recognized. Roentgenograms made at the beginning of treatment serve as permanent records and can be used for comparison later as the case progresses toward recovery under radiation therapy.

Accurate diagnosis is a prime essential if irradiation is contemplated, and should include exact location, extent, and nature of the tumor as determined by biopsy. Grading of the tumor as to malignancy and probable radiosensitivity are factors of great importance for the determination of the course of

therapy to be followed. In the author's opinion, all borderline operable cases should have a moderate amount of preliminary roentgen treatment before operation. It is his belief that this preoperative treatment will improve the end results. He also believes that in cases of advanced carcinoma it would be advisable to give such preliminary irradiation before a biopsy is done. Estimated radiosensitivity cannot always serve as a basis for prognosis. Coutard's conclusions as regards the response to irradiation are cited.

Concerning the technique of radiological treatment in connection with carcinoma of the larynx the so-called Coutard method is discussed briefly. The general principles governing the treatment are listed as follows:

1. There should be given sufficient dosage to destroy the cancer cells.

2. The dosage should be given in such a manner that it will destroy the cancer cells without destruction of the normal tissues.

3. The treatment must be given in a period of time that is short enough to prevent the development of radioreaction on the part of the cancer cell.

4. The treatment must be prolonged and must be given in such a dose that it will not seriously damage the normal tissue.

5. The normal tissues must be conserved in every way possible and the portal must be large enough to cover all of the diseased area but should not greatly exceed this area.

The matter of how the objectives can be met is discussed at some length. The author has used radium packs which he describes in detail in conjunction with roentgen rays. The packs were applied continuously for twenty-four hours at a time and repeated intermittently for a variable period. This procedure was followed by or alternated with high voltage roentgen therapy.

The surface dosage with the radium pack amounts to from 20,000 to 30,000 mgm. hours. The dose with 200 kv. roentgen rays filtered through 2 mm. of copper and 2 mm. of aluminum or the equivalent Thorax filter amounts to from 3,000 to 4,000 roentgen units given at the rate of 14 roentgens per minute and 250 roentgens per day.

The treatment used by the author produces a moderate degree of epidermitis with desquamation of the epidermis but usually no vesiculitis or ulceration of the skin. A moderate degree of epithelitis of the mucous membrane is also produced but there is a definitely less disturbing effect on the laryngeal mucous membrane and normal tissue (in proportion to the effect on the malignant disease) than is noted when roentgen rays alone are used. With this management there seems to be less disturbance of the general health such as nausea, vomiting and prostration but there is dryness of the mouth and throat associated with sticky mucus. No conclusions or statistical data of results are presented.

ADOLPH HARTUNG, M.D.

Jellen J. The Roentgenological Manifestations of Pulmonary Embolism with Infarction of the Lung. *Am J Roentgenol* 1939 41: 901.

Although pulmonary embolism with infarction of the lung is quite common and numerous articles relating to the condition have appeared in the literature there is a paucity of material dealing with the roentgenological aspects of the condition. With these facts in mind the author reviewed a series of 18 cases observed during the past three years in an attempt to analyze the roentgen findings and present them in a usable manner. Brief consideration is given to the etiology, pathogenesis, pathology and clinical features.

As regards the roentgen diagnosis attention is called to the fact that embolism which in itself is not demonstrable is not always followed by infarction. This explains the negative findings in some cases of clinically recognized pulmonary embolism. When infarction occurs, secondary roentgen evidence of the presence of an embolus may be obtained. An examination made just after the onset of an attack may reveal no evidence of infarction whereas a film made a few days later will reveal the infarct quite readily. Unsatisfactory films due to unfavorable technical circumstances are another source of difficulty in the recognition of the condition at times. The conclusions of various authors relative to their studies of the condition are cited briefly.

From a study of his own cases and a review of the literature the author is convinced that pulmonary infarcts present considerable variations in their roentgen appearance. When typical they appear as pyramidal or wedge shaped areas of increased density with their bases toward the periphery of the lobe but only a small proportion of infarcts show the typical pyramidal form. Many present shadows of indefinite and irregular outline probably due to surrounding inflammation. In some instances the shadow of the infarct is round or oval because the apex is directed sagittally with the base toward the anterior or posterior chest wall. A lateral view may reveal the pyramidal nature of these shadows. Clouding of the costophrenic angle may occur early and large infarcts may produce clearly defined areas of increased density at the bases of the lungs; they are less dense however than the shadows seen in pneumonia. Associated pleural changes may occur and become very marked. Accentuation of the hilar shadows on the side of the lesion may be present probably as a result of dilatation of the pulmonary vessels.

Septic infarcts usually heal quite readily and often disappear completely. In some cases a few fibrous strands or a residual pleural thickening may be noted at the site of infarction. Septic pulmonary infarcts may produce necrosis of the lung and result in abscess formation or gangrene. In such instances localized areas of rarefaction will be noted within the shadow of the infarct. The presence of a fluid level within the area of infarction presents confirmatory evidence.

There is considerable variation in the persistence of shadows representing infarcts small ones resolving rather quickly and large ones, or those accompanied by considerable pleural reaction, persisting the longest. The differentiation of infarct from pneumonia is not always possible at the initial examination, and other conditions sometimes present similar roentgen appearances. Usually the patient's history in conjunction with the findings leads to a correct interpretation. Several case reports with illustrative roentgenograms are appended.

ADOLPH HARTUNG M.D.

Rachet J and Arnous J. A New Method for Roentgenological Study of the Colon. Serial Roentgenography (*Une méthode nouvelle d'étude radiologique du colon. Les radiographies en série*). *Presse méd. Par* 1939, 47: 1093.

The authors present a critical review of the methods ordinarily used for roentgenography of the colon. Many organic lesions may escape detection when the barium enema is used, some of the abnormal images are due to artificial deformations and many may be the result merely of spasm and not of organic changes at all. A single roentgenogram of the colon is of no value, neither are several exposures taken at intervals of a few moments. Various modifications have been suggested to overcome the disadvantages of the barium enema. Even studies made after partial evacuation and insufflation, although of unquestionable value, may fail to demonstrate the smaller lesions. Localized compression likewise has advantages, but it may present false images of organic transformation. Colloid enemas have the advantage of exposing superficial lesions even when the deeper layers are intact, but this method requires special apparatus and training. Some roentgenologists take another exposure after an interval of some days or weeks, but the conditions may not be identical and precious time may be lost. It must be kept in mind that the enema penetrates in a direction opposite to that of

peristalsis which leads to reflex defense phenomena on the part of the colon which may in themselves give rise to misleading images. Of all the roentgenographic methods for study of the colon only the serial method will show the colon at a stage when spasm and defense have subsided.

Serial roentgenography has the great advantage of permitting differentiation between organic and functional disorders. By studying several pictures taken during peristaltic contraction one may be able to demonstrate two types of parietal deformation: those which are changed by peristalsis and those which are not affected by peristalsis. The reason that serial roentgenography has not been used much for study of the colon is that the movements of the colon are infrequent and superficial. During the space of a few minutes no such lively movement can be demonstrated as for instance, in the stomach. It is almost impossible to wait for the physiological movement to take place. The authors therefore suggest that a drug be administered to stimulate peristalsis and exposures made every ten minutes.

The preparation of the patient is most important. The authors follow the recommendations of Porcher. No laxative or purgative enema is given but a large saline enema is administered on the preceding evening. A second identical enema (saline solution, 15/1000) is given in the morning one hour before examination and if the solution does not return absolutely clear a third enema of 200 ccm of lukewarm water is given just before the examination.

Certain precautions are indispensable for obtaining good pictures. The barium suspension must be homogeneous. The temperature of the suspension should be 37° C. The injection should be made under as little pressure as possible. Rare cases of rupture of the colon due to excessive pressure have been reported. Insufflation is of importance in order that the walls of the colon be distended. For stimulation of peristalsis the authors give a subcutaneous in-

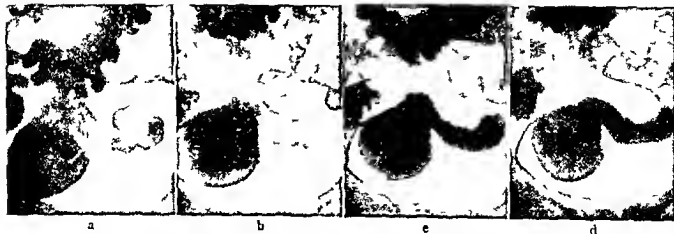


Fig. 1. (a) Sigmoid stricture in contrast to supra- and subjacent segments. (b) twenty minutes after prostigmine failure to distend on insufflation. (c) thirty minutes after

prostigmine same localized rigidity. (d) forty minutes after prostigmine immobility of the sigmoid caliber in all the exposures.

jection of prostigmine. Other substances such as pituitary extract from the posterior lobe may also be used for this purpose. The injection is made twenty minutes before the examination. Experiments are being made with a double injection of prostigmine to stimulate peristalsis and of atropin to relieve spasm. The authors usually employ the barium enema after partial evacuation. Usually a mild insufflation is added.

The roentgenoscopic examination will indicate the best position of the patient for the roentgenographic study. The position must be compatible with immobilization for about an hour. A mark is placed on the skin in the center of the area to be exposed. A sample picture is taken and developed to serve as a guide for further exposures. From 5 to 8 exposure are then taken every ten minutes. Beclers's selector may be used although the authors believe it to be of questionable value. Seven short case reports illustrate the results obtained by this method. Serial roentgenography of the colon will permit determination of the extent of the lesions, decision as to the operability of a tumor and sometimes even reveal the nature of the lesion. EDITH SEBANCUR MOORE

**Renander A.** Roentgen Photographs of Perforative Diverticula of the Colon (Roentgenbilder bei perforierenden kolon divertikeln). *Lets radiol* 1939 20 215

The author reports 2 cases of Graef's diverticulum in working men sixty three and fifty six years of age respectively. There was pain in both cases, tenderness to pressure and defense reaction of the muscles in 1 case and a fist sized lump in the left lower abdomen in the other case. In both cases an abnormal contracted state and hausturation indicated colitis. In 1 case the contrast enema disclosed a diverticulum the size of a raisin from which a fistulous tract led to a cavity the size of a plum, both the tract and the cavity were medial to the proximal portion of the sigmoid. In the other case there was a cavity the size of a date with a fistulous tract leading up to the shadow contour of the intestine which exhibited numbers of very small diverticula. Actual entry into a diverticulum could not be demonstrated. Both patients recovered without operation. JOHN W. BRENNAN, MD

**Clement R. Gibert P. and Clénet E.** Roentgen Therapy of Adenoiditis in Children (Roentgen thérapie des adénoïdites de l'enfant). *Presse méd* Par 1939 47 786

Clement and his associates note that infection and hypertrophy of the lymphoid tissue of the nasopharynx play an important role in the causation of pathological conditions in infants and children. In infants hypertrophied adenoids interfere with nursing and swallowing with resultant gastrointestinal disturbances. They cause respiratory obstruction with resulting otitis and infection of the lower respiratory tract as well as infection and enlargement of the regional lymph glands. If the

condition is of long standing it may result in malformation of the upper jaw and the characteristic adenoid facies.

In some cases infection and slight hypertrophy of the adenoid tissue may be treated by medical means. However if the adenoids are large medical treatment is not effective. In many cases surgical removal is the best method of treatment yet surgery cannot solve all the problems. Surgical removal is not indicated in infants less than a year old many surgeons prefer not to operate before the child is three or four years of age. In some cases it is impossible to control the infection so that operation would have to be done in an infected field and when the patient is feeble in other cases there is a definite tendency toward hemorrhage that contraindicates operation. In such cases the authors consider that roentgen therapy is indicated. Roentgen therapy is also indicated in children in whom operation has been done but in whom all infected tissue has not been removed and nasopharyngeal infection and suppuration persist.

The authors have employed roentgen therapy in 14 infants under seven months of age in whom medical treatment was not effective and surgery was contraindicated. Nine of these patients were cured and in 3 the condition was greatly improved, in 7 of the latter the condition improved further after treatment and was finally cured. In 2 the treatment was ineffective. Of 13 children from seven months to six years of age who were treated with the roentgen rays 8 were cured and in 5 there was improvement. Operation was finally necessary in only 2 cases. Nine children from three and a half to twelve years of age in whom several operations had been done without control of the infection were treated with the roentgen rays of these 6 were cured and 3 showed improvement in their condition.

In the treatment of adenoids with the roentgen rays the eyes are protected by a leaded rubber shield fitted to each patient. Two portals of entry, one on each side above the angle of the lower jaw with the rays directed toward the cavum oris are employed and a third median field including the nose with rays directed from in front backward is also employed. Each field is 6 by 8 cm. the focal distance is 28 cm. 200 kv. are employed with a filter of 15 mm of copper 1 mm of aluminum and 1 cm of wood. The most effective dosage has been found to be from 100 to 200 roentgens to each field according to the age of the patient, all three fields being treated simultaneously. Three treatments are given at four day or five day intervals. The total dosage is therefore from 360 to 600 roentgens per field, the total dosage in the tissues of the nasopharynx is calculated from 500 to 1000 roentgens. With young infants the smaller dosage is employed with deep seated infections a small initial dosage is employed to prevent an immediate reaction and with marked hypertrophy the larger dosage is necessary. With this technique no undesirable effect on the skin or nasopharyngeal tissues has been observed. ALICE M. MEYERS

O'Brien F W The Treatment of Severe Carbuncles with X Rays *New England J Med* 1939 220 917

The great value of x ray therapy in the relief of pain shortening of the period of illness, and lessening of the mortality rate reported by many writers whose results are briefly reviewed are substantiated by the results obtained in this report. One hundred and thirty cases of severe carbuncle were treated in Boston City Hospital with x rays alone or in conjunction with surgery the mortality rate was 3 per cent. Sixty patients were treated by roentgen therapy only their hospital stay was the shortest of the entire group and only 1 of these patients died. There was no death in 57 cases of facial carbuncle treated either alone or chiefly by roentgen therapy. The author's experience with diabetes leads him to challenge the dictum that the treatment of carbuncles in diabetics with x rays without surgery is contraindicated. HAROLD C OCHSNER M D

Jares J J and Warren S L The Physiological Effects of Radiation A Study of the *in Vitro* Effect of High Fever Temperatures Upon Certain Experimental Animal Tumors *Am J Roentgenol*, 1939 41 685

This is the first of a series of studies upon the effects of heat and roentgen radiation, both alone and in combination and with various dosage systems, upon normal tissues and various types of tumors. In this article investigations relating to the approximate thermal death time of tumor fragments exposed *in vitro* to temperatures tolerated by the living human body are reported. The technique used is described in detail. Consideration is given to the results obtained with various tumors under different experimental conditions and the findings are tabulated and charted.

From these studies the authors conclude that temperatures of 41.5 and 42.0° C. are capable of damaging or destroying mouse sarcoma 180 rat carcinoma 256 Jensen rat sarcoma and the Brown Pearce rabbit epithelioma *in vitro* after appropriate periods of exposure. ADOLPH HARTUNG M D

Ellis F The Radiosensitivity of Malignant Melanomas *Brit J Radiol* 1939 12 327

The opinion generally held is that melanomas are not a radiosensitive group of tumors. The author, however suggests that some melanomas are radiosensitive. After a thorough review of the medical literature for evidence supporting one or the other of these opinions he publishes a report of a series of 38 cases of malignant melanoma referred for treatment to the Sheffield Radium Center during the years from 1931 to 1937.

The cases are divided into six groups according to the results obtained. (1) 12 cases in which radiotherapy could definitely be considered successful (2) 2 cases in which success was doubtful (3) 7 cases in which radiotherapy failed (4) 6 cases in which the evidence was indefinite (5) 7 cases in which

treatment was given after removal of the eye for sarcoma of the choroid, and which were really similar to those in Group 4 and (6) 4 cases which were not treated. All of the cases are described briefly in the text and some are illustrated with roentgenograms photographs and microphotographs.

Radium in the form of interstitial implants, was used for irradiation exclusively both in the primary and metastatic lesions. In only 4 instances was some sort of x ray treatment added. The dosage of the radium which is expressed in mgm hours as well as the newer unit of roentgens, is given in detail for every case. The author stresses the fact that the dosage must be as correct as possible since an excessive dose which would damage the normal tissues to such an extent that the supply of 'antibodies' carried in the blood and lymph stream would become inefficient, would lead to a survival of the malignant cells, thus giving rise to a so called recurrence.

The conclusion is drawn that some malignant melanomas are definitely radiosensitive, and that in the process of radium irradiation, tissue damaging doses must be avoided. With a dose of from 5 500 to 6 000 roentgens administered uniformly throughout the affected region in from seven to ten days the author anticipates no failures except in the occasional unexplained case of poor general resistance. T LEUCURIA M D

## RADIUM

Strandquist M Radium Treatment of Cutaneous Cavernous Hemangiomas with Surface Application of the Radium Tubes in Glass Capsules *Acta radiol* 1939 20 185

Since 1909 the method of choice for the treatment of hemangiomas at the Radiumhemmet in Stockholm has been irradiation with radium. The results and technique in the flat hemangiomas treated with  $\beta$  radiation have been published previously. In the present article, the author deals with the cavernous type of lesions in which  $\gamma$  radiation is preferably used.

The material includes 263 cases treated in the years 1936 and 1937. In 85 per cent of the cases the hemangiomas were solitary in the remainder from 2 to 5 lesions occurred in the same patient, so that the total number of hemangiomas irradiated amounted to 300. Seventy per cent of the hemangiomas were superficial 10 per cent deeply situated and 20 per cent were of the mixed type. In 5 per cent the covering skin was ulcerated at the time of the institution of the treatment.

The good cosmetic result obtained by radium therapy is largely due to the technique and dosage. If the radium is applied too long or improperly, an atrophy of the skin may develop on the other hand if the application is too short or too superficial in action there may be no effect on the hemangioma. In the cavernous hemangiomas the intensity of the radium must be such that there is no appreciable

difference between that on the surface of the skin and that at the depth of the lesion. This may be realized by the use of  $\gamma$  radiation at a short distance from the skin the primary  $\beta$  rays being eliminated by suitable filtration.

The author goes to great length in describing the various radium containers and applicators which are used at Radiumhemmet under different situations.

The dose is expressed in terms of the average dosage given to 1 cm. of the superficial tissue layer rather than in terms of the surface dose. This was arrived at by a simple practical experience. The calculation is based on the following formula

$$I_a = \frac{I + 4I_5 + I_{10}}{6}$$

$I_a$  is the average intensity in a superficial tissue layer of 1 cm. thickness.  $I$  is the surface intensity.  $I_5$  the intensity at a depth of 5 mm. and  $I_{10}$  the intensity at a depth of 10 mm. The treatment time is figured according to the average intensity and the corresponding dose is called the average dosage in 1 cm. of tissue layer.

The average intensity has been calculated for each of the containers or applicators in roentgens per hour and the corresponding treatment time for the different average doses tabulated. In the 300 hemangiomas treated the average dose varied between 600 and 1 100 roentgens whereas the surface dose varied between 1 200 and 2 200 roentgens.

The final results were estimated at a maximum time of two and one half years and a minimum time of one and one half years after treatment. In 93 per cent of all the cases good healing was obtained with only one treatment in the remainder a second treatment proved necessary.

A very important factor in the radium treatment of cavernous hemangiomas is their varying radio sensitivity. It is a known rule that embryonic cells possessing great proliferative activity are extremely radiosensitive. This may explain the high degree of radiosensitivity of cavernous hemangiomas during the first weeks of life and of those of very rapid growth. At any rate in such instances an average dose of from only 700 to 750 roentgens will bring about excellent results whereas in later life or in the thicker inactive lesions the dose must be increased to from 850 to 900 roentgens to obtain a similar effect. For this reason it is recommended that radium therapy be instituted as early as possible preferably during the first three months of life and that a rapidly growing lesion be treated immediately even during the first weeks of life.

The general conclusion is reached that  $\gamma$  ray therapy as described forms a suitable method for the treatment of the deep as well as the superficial cavernous hemangiomas and leads to good anatomical healing and very satisfactory cosmetic restoration. Some unusual cases are illustrated photographically to prove this contention.

T. LEUCUTIA M.D.

## MISCELLANEOUS

### CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Clément R. Dolichostenomelia (Marfan's Syndrome) (La Dolichosténomélie Arachnodactylie Dolichosténie Syndrome de Marfan) *Presse méd* Par 1939 47 527

In 1896 Marfan described the condition of dolichostenomelia as characterized by unusual length and slenderness of the limbs. The bands are very long and the long fine fingers are kept in a semi flexed semi extended attitude which gives them the so called "spider finger" appearance. The entire skeleton is affected by the dystrophy. The vertebral column as well as the thorax face and cranium are affected. Furthermore there is a marked laxity of the ligaments generally as well as malformations of the heart, eyes, ears and palate. More than 200 observations have been published in the literature and there are no doubt, some latent forms. Although some cases have been noted at birth the condition is most often apparent at the age of twelve or thirteen years. The muscles to the elongated bones are slender and hypotonic. Kyphosis and scoliosis are common. The thorax is flat, elongated, and narrow. The face is long and narrow, the palate high and narrow and the cranium almost always dolichocephalic. The entire morphological appearance is due to the elongation and slenderness of the skeleton under development of the muscles, absence of the panniculus adiposus and slenderness of all the tissues.

Röntgenological examination of the skeleton indicates normal bone structure but elongation and thinness. The striking feature is the narrow transverse diameter compared to the length of the bone. A precocious appearance of centers of ossification and even supernumerary centers of ossification have been reported. Because of the changes in the bones, muscles, and fat of the face the features look prematurely old. Fitcher and Southworth have reported deformities of the external ear in from 20 to 70 per cent of the cases. Ectopy and congenital subluxation of the crystalline lens of the eye, various congenital deformities of the heart and of the lungs and a tendency toward infantilism with retardation in the development of the secondary sex characteristics have been noted. The basal metabolism is decreased by from 25 to 30 per cent. Mental faculties are unaffected. The mortality is quite high, the most common cause of death is respiratory disease.

As to the pathogenesis there are various theories. Brissaud considers the condition to be of hypophyseal origin and calls it "fetal gigantism." Some say there is a mixed glandular disturbance involving both the hypophysis and the parathyroid glands.

The condition is hereditary and familial in occurrence. Viallefont and Temple have reported 16

families with this condition through three generations. The transmission is directly from either parent without skipping of a generation as occurs in menelian transmission.

Treatment consists of exercises to strengthen the muscles, orthopedic appliances to prevent and correct deformities and endocrine therapy to subject infantilism.

There is an extensive bibliography on this subject.  
JACOB F. KLEIN, M.D.

Johnson B. A. and Meleney F. L. The Antiseptic and Detoxifying Action of Zinc Peroxide on Certain Surgical Aerobic Anaerobic and Microaerophilic Bacteria. *Ann Surg* 1939 109 881

The authors tested the antiseptic action of zinc peroxide *in vitro* on certain aerobic, anaerobic, and microaerophilic organisms commonly found in surgical infections. A marked reduction in the viable count after four hours of incubation of seeded broth suspensions of zinc peroxide, at 37.5°C and sterilization of the suspensions within twenty-four hours were taken as a criterion of sensitivity.

On this basis they classed the following organisms as sensitive to the bactericidal action of zinc peroxide *in vitro*: hemolytic streptococci (aerobic anaerobic and microaerophilic), pneumococci, the vegetative forms of anaerobic spore bearing bacilli—(clostridia welchii, tetani, histolyticum, sporogenes, novyi, sordelli, and edematis maligni), the anaerobic non spore forming bacteria (non hemolytic streptococci, both anaerobic and microaerophilic, bacilli fusiformes and bacilli necrophorum).

The organisms which proved to be relatively resistant were the streptococcus viridans, staphylococcus aureus, bacillus coli, bacillus proteus and bacillus pyocyaneus. The spores of the anaerobic spore bearing clostridia were also relatively insensitive. Of the species tested, the spores of clostridium welchii and clostridium tetani were more susceptible than those of the other bacilli in this group. The hemotoxins of streptococcus and clostridium welchii are destroyed or inactivated by zinc peroxide *in vitro*.  
FREDERIC W. IFFELD, M.D.

Touraine A. and Duperrat R. Cutaneous Amebiasis (I amibiase cutanée). *Presse méd* Par 1939 47 1036

Cutaneous amebiasis is little known. Hitherto no collective study has appeared on this subject in France. Even its existence was questioned by Dobell in 1919. More recently it has been admitted that the condition is not altogether exceptional. Extensive ulcerations have been described following incisions of liver abscesses. The condition is most common in the Far East. In 1927, Van Steenis collected 20 cases. In 1933, Ngai and Frazier reported 30 cases. Altogether 74 known cases have been de-



Fig. 1. Erythema and furunculoid lesions of the back of the hand of amebic origin.

scribed and probably a dozen suspected cases. Recently Mariano Castex and Borda drew attention to non specific allergic eruptions becoming manifest during the course of intestinal amebiasis and responding to emetine. In view of the widespread distribution of amebiasis an incidence of 74 cases would seem very low indeed. It has been estimated that from 5 to 10 per cent of the entire population of the United States have histolytic ameba in their stools. Many hitherto obscure digestive diseases have been found to be caused by the ameba. Cutaneous amebiasis is a very rare complication of dysentery.

Of 60 analyzed cases of cutaneous amebiasis 42 could be traced to earlier amebic lesions of the surrounding tissues. 30 followed the evacuation of pus (22 the surgical or spontaneous opening of an abscess of the liver, 6 a pericecal abscess of appendiceal origin, 2 a fistula of the colon which in 1 case was the result of extirpation of cancer). In 20 cases the ulceration developed on the abdomen following laparotomy and in only 1 case on the chest following thoracotomy. In 1 case of the chest following intrapleural incision of an abscess of the liver. In 12 cases the ulceration occurred in the anal region in association with amebic rectitis. In 18 cases the infection occurred by inoculation or dissemination from a distance in 8 on the skin, in 6 in the genital mucosa, in 3 in the form of isolated subcutaneous abscesses, and in 1 as a mixed infection from a distant focus and extension. The allergic types described by Mariano Castex must also be considered.

In cutaneous amebiasis following incision of a visceral amebic abscess a progressive postoperative gangrene develops in from two to sixty days after operation but most frequently between the fifth and twentieth days. There is first a light reddening in the center of which a furuncle develops after two or three days. The necrosis extends eccentrically from 2 to 6 or 8 mm. per day and may attain the size of the palm of a hand within fifteen or twenty days. The extension may be regular or irregular. Frequently necrotic matter is expelled from the center. The wound presents five distinct zones from the center to the periphery: central ulceration, a corona of gangrene, a margin of elimination, a pink or purple marginal area frequently infiltrated with small abscesses and very painful and last a halo of

bright bluish red from 2 to 4 cm. wide between the lesion and the healthy skin. The area covered by this halo is likewise extremely sensitive and painful. The ulceration remains superficial and destroys only the skin and subcutaneous cellular tissue. In very rare cases the muscles have been involved and occasionally there may be a central cicatrization. The glands are not or only slightly affected. The general condition changes rapidly. The temperature rises to 40° C. There is no anemia but a variable leucocytosis with polynucleosis but without marked eosinophilia is present. The prognosis is grave and before the introduction of emetine the outcome was almost always fatal in a few days or weeks unless the lesion was immediately excised.

Perianal amebiasis likewise has its origin in an abscess at the margin of the anus and will likewise produce extensive necrosis. Sometimes the inflammatory and necrotic phenomena are less marked and there is a less rapid course. The lesion bleeds easily. Pressure yields a fetid serous fluid mixed with pus. The wound enlarges progressively and extends to the perineum, thighs and scrotum. Zones of induration and islets of epidermization may form or a vegetating epithelial proliferation (pseudoneoplasia) may develop. As a rule examination of the anus and rectum will reveal dysenteric lesions such as ordinary rectocolitis or abscess and fistula. Care must be exercised not to confuse perianal amebiasis with the perianal proliferations of proliferating rectitis or condyloma indicating amebic stricture of the rectum.

In the purely cutaneous forms of inoculation amebiasis as seen in patients with dysentery the lesions usually appear somewhere on the skin at a great distance from the anus or other amebic foci. They contain the histolytic ameba and respond promptly to emetine. Three clinical types have been distinguished: a progressive extensive type, a limited torpid type, and a subcutaneous type. Lesions have been described on the penis of the male and at the urethral orifice in the female. In fact genital amebiasis seems more common than hitherto suspected. It is suggested that there may be an amebic venereal syndrome pure or in association with lymphogranuloma inguinale. Recently attention has been drawn to amebic stricture of the rectum.

Recently Mariano Castex reported 18 cases of allergic amebic dermatoses including anal pruritus, stubborn urticaria, acne rosacea, and pemphigus. Clubbed fingers have been noted in case of chronic amebiasis. In 1938 Doukan reported a case of buccal melanosis in an amebic patient. In all these cases diagnosis is made by demonstration of the entameba histolytica of Schaudinn in the lesions. The pathology, pathogenesis and factors favoring amebic infection are discussed in detail. More remarkable results may follow the administration of emetine with cures in a few days of lesions that had resisted all other treatment. The drug is administered in doses of from 6 to 10 gm. daily in two subcutaneous



injections for from six to eight days. In severe cases intravenous administration may be of benefit. Its efficacy is not constant and relapses may follow. In cases of mixed infection surgical excision may be required.

EDITH SCHANCHIE MOORE

Stout A. P. The Painful Subcutaneous Tubercle (Tuberculum Dolorosum). *Am J Cancer* 1939 36 25

An investigation of 2,081 superficial tumors of the skin and subcutaneous tissues showed that 20 or approximately 1 per cent, were associated with attacks of paroxysmal pain. Almost all of the reported superficial nodules associated with paroxysmal pain seem to have been either glomus tumors or leiomyomas. This study discloses that other tumors such as neurofibroma, fibroma, fibrosarcoma, keloid, dermoid cyst and benign epithelioma in a sebaceous cyst may be associated with the same type of pain. The tuberculum dolorosum, therefore, is not confined to a single tumor form but may manifest itself in a variety of morphological types. No adequate explanation for the occurrence of the attacks of paroxysmal pain could be found.

MANUEL E. LICHTENSTEIN M.D.

Trolitzky A. A. Progressive Gangrene of the Skin (Fortschreitende Gangraen der Haut). *Arch. biol. nauk* 1938 52 237

The author describes the rare clinical picture of progressive gangrene of the skin on the basis of 62 cases from the literature and 4 cases observed by himself. He gives case histories and illustrations. The onset of the condition is characteristic. It begins with an injury of the skin, most often an operative wound in the presence of a septic process. It appears from one to two weeks postoperatively. There is steady progress of the gangrene peripherally with central healing, i.e., granulation and epithelization, arising from the remnant of the deeper cutaneous glands. The persistent pain, often even after the cessation of the process, may cause such suffering as to produce a severe disturbance of the patient's general well being and may even lead to suicide. The mortality rate is about 20 per cent.

Histological study and post mortem examinations produce no significant findings. The various bacteriological factors concerned are shown to be the streptococcus and the staphylococcus as well as the proteus, often existing in symbiosis. Even if experimental skin necrosis could be produced with these various organisms, the proof of the significance of a specific organism could not be claimed. The experimental findings alone cannot make clear the cause of the disease, which disease as a special entity should in no case be identified with the other skin necroses familiar to every surgeon. Of pathogenetic importance in the opinion of the author is the part played by the nervous system—a fact suggested by the severe pain—in the form of a primary disturbance of the neurotrophic balance. On the basis of such an injury an existing infectious agent

can produce the described skin changes at first opportunity in a focus of damaged skin concomitant with a preceding general weakening of the organism as a whole. The treatment can only be surgical. It consists of cauterization of the entire border zone of the gangrenous skin surface (also the deeper parts) with the Paquelin cautery, and the application of ointment dressings and novocaine block to allay pain. At the end of the article there is a tabular summary of the entire 66 cases, as well as a comprehensive bibliography.

(SCHÖNER) JOHN MARTIN M.D.

Iura V. Anemia Following the Amputation of Limbs (Anemia postoperatoria da amputazione di arti). *Riv. de chir.* 1939 5 191

Iura recalls the work done in the past decade on hematological variations following resection, partial or total, of the stomach, and comments upon the relative frequency of a hypochromic type of anemia in contrast with the Biermer type which is rather rare. He attributes the fact that this observation should have escaped the attention of most workers to an insufficiency of determinations made before and immediately after surgical intervention. Quoting from observations previously submitted by himself, he notes that erythrocyte and hemoglobin values undergo immediate depression following operation and are restored to pre-operative levels only after a more or less prolonged interval. The same curve results from the removal of portions of the small intestine. By means of the same methods the author proposes to study hematological variations following the amputation of limbs, and the consequent loss of hematopoietic tissue.

The subject chosen for study was a male peasant eighteen years of age whose family history was non-contributory and whose past history included measles during infancy, malaria at four years with subsequent complete cure, and mumps at eleven. In July of the year in which he was operated upon (1937), he developed signs and symptoms of an osteogenic sarcoma of the left tibia. The clinical and roentgenological pictures were typical. All other pathology was ruled out and amputation was performed at the middle third of the thigh, on March 10, 1938. The wound healed by primary intention and the patient was dismissed twenty five days later. Blood counts made pre-operatively showed the erythrocyte count to be 4,200,000, hemoglobin, 85 per cent, leucocytes 5,200 and a color index of 0.97. Postoperative determinations on March 11 revealed an erythrocyte count of 3,700,000, hemoglobin, 78 per cent, and a color index of 1.05. Values descended steadily till on March 15 there was a minimal erythrocyte count of 2,510,000, the hemoglobin showed 52 per cent, and the color index was 1.04. The curve then rose until on March 29 determinations showed the erythrocyte count to be 4,800,000, hemoglobin, 80 per cent, and the color index 0.83. The author emphasizes the fact that almost no blood was lost during the operation.

A comparable case of sarcoma of the tibia in a sixteen year old male was operated upon at the Clinica Chirurgica of Rome on April 23 1939. Although the data particularly the pre operative were incomplete a well defined anemia was demonstrated this lasted up to the thirty second post operative day (erythrocytes 2 060 000 hemoglobin 8 per cent) at which time the patient was dismissed. His general condition was good and there was no evidence of metastasis or recurrence. Lura believes that these cases are analogous to such conditions as osteosclerosis and aplastic anemia from loss of medullary tissue in which anemia is closely related to skeletal pathology. For the clinical entity here described he suggests the term hypogenerative myelogenous anemia secondary to surgical intervention.

[DITH FARNSWORTH M D]

Rebeck P Contribution to the Study of the Variations of Azotemia and of Chloridemia in Experimental Shock Caused by the Use of the Tourniquet (Contributo allo studio delle variazioni della azotemia e della cloruremia nello shock sperimentale da laccio emostatico) *Ann ital di chir* 1939 18 299

Shock occurring in cases of injury to an extremity after prolonged application of a tourniquet has been necessary for hemostatic purposes appears suddenly upon release of the constriction as if through massive intoxication. Thus the suspicion arises that the substances which cause the shock may originate between the traumatic focus and the tourniquet that is in the healthy tissue which is temporarily excluded from the circulation but in which the circulation reappears rapidly as soon as the obstruction is removed. It has also been noted that prolonged application of a tourniquet without the presence of traumatism is capable of causing shock of a gravity proportionate to the duration of the constriction the shock being fatal if the constriction exceeds five hours. The most important and immediate symptom of this shock is fall of the blood pressure which is attributed to the release of toxic products formed in the tissues excluded from the circulation. As these products must belong to the nitrogen series and consist probably of the primary products of disintegration of proteins Rebeck decided to investigate the variations in azotemia (urea nitrogen noncoagulable nitrogen and non ureic non coagulable nitrogen) and in chloridemia. The experiments were made on two young dogs of average size and blood was taken from the vein of the contralateral extremity before application of the tourniquet which lasted four and six hours respectively and at various times after removal of the tourniquet.

The results were so clear and uniform that it was thought unnecessary to continue the experiments in other animals. As soon as shock was produced the increase in the nitrogenous products of the blood was considerable the increase involving especially the non ureic non coagulable nitrogen fraction. The increase of this fraction preceded the increase of the

urea nitrogen and later the non ureic non coagulable nitrogen decreased as the urea nitrogen increased. Consequently the intoxication due to shock is caused by the less deteriorated but extremely toxic products of protein decomposition occurring in the tissues above the site of the tourniquet as a result of circulatory and nervous disturbances.

At the same time the chlorides were decreased and the decrease persisted until the following day notwithstanding the return to nearly normal of the nitrogen values. This seems to confirm the hypothesis that the chlorides are used by the organism during the process of disintoxication to facilitate the disintegration of the proteins. The fall in the blood pressure must be attributed to intoxication by little deteriorated protein substances.

RICHARD KEMEL M D

Romay R S Metastatic Brain Tumors (Tumores metastásicos cerebrales) *Arch argent de neur* 1939 20 89

Metastatic brain tumors are much more frequent than has generally been assumed. This fact is demonstrated by the numerous publications on this subject which have appeared in recent years. The greatest number of metastases in the brain are formed by epitheliomas of the lungs breasts and suprarenal glands. Either single or multiple metastasis may be found in the meninges and the white or gray substance of the brain. In neoplasms of the pulmonary apices the lymphatic mode of propagation is the most probable one while in tumors of other locations dissemination through the blood stream must be considered of prime importance. Epitheliomas of the suprarenal glands seem to have a certain affinity for the brain as the latter may be the sole site of the metastasis.

Metastatic brain tumors do not produce a characteristic clinical picture and may be confused with primary cerebral tumors.

Usually an increased cranial pressure and edema of the discs are present in metastatic brain tumors although exceptions to this rule occur the same is true in the case of primary tumors of the brain. Metastatic tumors not only separate the specific tissue but may, in some cases infiltrate and destroy it completely.

Spinal puncture is contraindicated in cerebral tumors with papilledema. Twenty case histories are furnished by the author. They show that the progressive evolution of the metastases is very marked and that the reabsorption of toxins from the primary and secondary tumors causes a speedy disintegration of the proteins. The resulting physical and mental asthenia is profound and an early mental confusion is the result.

The correct diagnosis may be difficult if the primary tumors remain latent. In making the differential diagnosis one must consider hydrocephalus serous meningitis encephalitis brain abscess multiple sclerosis and thrombotic processes.

JOSEPH K. NAKAT M D

Swinton N W and Hodge C C The Treatment of Pilonidal Sinus *Surg Clin North Am* 1939 19 699

The incidence of recurrence of pilonidal sinus after radical excision is too high, according to the authors. In order to determine the plan of management which proved to be most satisfactory the various methods of treatment employed over a ten year period at the Lahey Clinic were subjected to an analysis and the results presented.

All observers agree that pilonidal sinus is the result of some disturbance of embryonic development. The patients with this condition are usually seen in the second or third decades of life and the ratio of males to females in the authors' series was 3:1. Abscess formation usually first draws attention to the sinus and repeated abscesses usually occur which lead to multiple sinus tracts involving large areas over the sacrococcygeal region. Although a number of conditions may simulate pilonidal sinus, the presence of multiple sinus tracts in the midline over the sacrococcygeal joint is almost always pathognomonic of a pilonidal sinus. Rectal examinations are important to rule out anorectal fistula.

In the authors' series of 85 patients 30 per cent had had previous radical excision with recurrence. Three types of operations for removal of the sinuses were utilized: (1) excision of the sinus region with primary closure; (2) block excision with transplantation of a pedicle flap (as described by Lahey in 1920); and (3) a simple type of block excision which is the method preferred by the authors.

Excision with primary closure is justified only when there are small sinus tracts relatively free from infection and confined to the midline. The high incidence of recurrence and the likelihood of infection have convinced the authors that this method should be used only in carefully selected cases.

Block excision with transplantation of a bi-pedicle flap from the adjacent buttock and primary suture of the flap is advantageous in a few cases in which excessive scar formation is present over the sacrum and coccyx. The incidence of recurrence, however, is highest in this group (35 per cent). Infection is frequently encountered with this procedure and is an important factor leading to recurrence.

The most satisfactory results are obtained by means of a modified type of block excision. The authors agree with Rogers in that many block excisions are too extensive and sacrifice good tissue. All sinus tracts and, usually, all scar tissue should be removed by careful dissection. However, other tissues should be carefully preserved so that the resultant defect will not be needlessly large (Fig 1).

The importance of the after care of patients is stressed. Hospitalization for two or three days is usually sufficient. The gauze packing which is inserted into the wound at the time of operation is removed at the end of thirty-six hours. Thereafter the wound is dressed twice weekly until it is completely healed, sufficient gauze being inserted at each dressing to keep the wound edges apart. Local

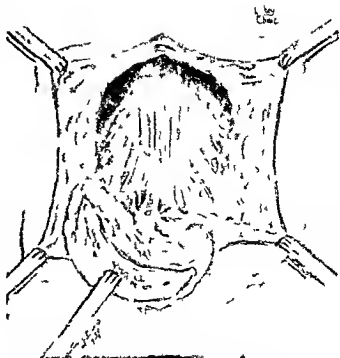


Fig 1 Block excision of sinus tracts and scar tissue. The dissection is carried down in this case to the fascia overlying the sacrum and coccyx. This is not always necessary.

application of a modified Carnoy's solution and alcohol is employed. Patients are advised to take Sitz baths twice daily at home between dressings.

Healing of wounds treated by the advocated method is always slow, the time required for healing varying from four months to a year. The authors are convinced, however, that this is the most satisfactory method of treating pilonidal sinus because recurrences are much less apt to occur.

LUTHER H WOLFF M D

#### GENERAL BACTERIAL PROTOZOAN AND PARASITIC INFECTIONS

Elliott S D Bacteriemia and Oral Sepsis *Proc Roy Soc Med Lond* 1939 32 747

The following abstract of his paper is presented by the author.

Transient streptococcal bacteremias are a frequent sequel to dental extractions especially when the mouth is the seat of severe chronic gum infection. Bacteria may also gain admission to the blood stream in such cases irrespective of operative procedures and probably as the result in many instances of minor degrees of gum injury such as is produced by biting on a loose tooth. Acute apical infections do not appear to be associated especially with blood infection of this kind, the focus of infection apparently being effectively walled off by the associated inflammatory reaction.

Of the two factors, infection and trauma involved in the production of these postoperative bacteri-

mias infection appears to be the more important since when it is marked very slight degrees of gum injury are sufficient to produce blood stream invasion. In the complete absence however of the type of trauma induced by the rocking of a tooth during its removal extraction may be accomplished without the production of a heavy bacterial shower in the blood.

Usually these transient bacteremias produce no permanent ill effect but there is some evidence that when they occur in subjects with abnormal heart valves they may lead to subacute infective endocarditis. Thirteen cases are reported in which the valvular infection appeared to result from a post operative dental bacteremia.

Prevention of such bacteremias may be achieved by the reduction or elimination of infection and trauma. Complete elimination of the gum infection is difficult although preliminary treatment of the gum margin by some measure such as cauterization may lessen it and lead to a reduction of the post operative bacterial shower. Similarly as little manipulation of an infected tooth as possible during its extraction will decrease the incidence or degree of blood infection.

SAMUEL H. KLEIN, M.D.

#### DUCTLESS GLANDS

Thompson W. O., Thompson P. K., Taylor S. G. III and Hoffman W. S. The Treatment of Addison's Disease with Adrenal Cortex Extract. *Endocrinology* 1939 24 774.

The effect of prolonged administration of adrenal cortex extract by subcutaneous injection for maintenance therapy and intravenous injection in crises is reported in 7 patients with marked Addison's disease. Detailed case histories are included. In 2 patients active tuberculosis was present. Four patients are living and have received the extract for from one to three and one quarter years. Three patients carry on their usual activities while 1 with active tuberculosis is confined to the hospital. It is concluded that from 10 to 20 c cm. of the extract will maintain life for long periods without any other form of therapy. Larger amounts are probably necessary to produce optimal results.

In crises prompt treatment is imperative. The intravenous administration of 10 c cm. of active adrenal cortex extract and about 170 c cm. of 5 per cent glucose in normal salt solution per hour until vomiting stops and appetite returns is recommended. Early in a crisis extract alone may produce a revival of the patient but when the crisis is well advanced other measures are required presumably because of depletion of the sodium reserves. For maintenance after a crisis injections of extract (at least 10 c cm. daily) or 12 gm. of sodium chloride and 4 gm. of sodium citrate or bicarbonate daily by mouth, or both procedures are recommended. The low potassium diet reported to be of value by Wilder, Allers, and Kendall is mentioned. A high calorie diet is advised and failure to gain weight is usually a serious omen. When the basal metabolism is low raising it to normal with a suitable dose of thyroid is considered an important part of the treatment.

WALTER H. NADLER, M.D.

#### HOSPITALS MEDICAL EDUCATION AND HISTORY

Strayer L. M. Augustin Belloste and the Treatment for Avulsion of the Scalp. *New England J. Med.* 1939 220 901.

Strayer notes that several of the modern authors namely Homans, Christopher and others, advise the perforation of the outer table of the skull in cases of avulsion of the scalp in which the periosteum is removed from the calvarium. Most of the recorded references to the operation give credit for the procedure to James Robertson who described and published it in the *Philadelphia Medical and Physical Journal* in 1806. All of the periodical literature published since 1850 gives Robertson the credit for priority. Strayer however traces this therapeutic method back to Belloste who in 1696 gave a complete description of this method in a book entitled *Surgeon of the Hospital and a Method to Heal Promptly*. Celsus had previously advised perforation of the dry, blackened sequestrum with an awl some time after the injury while Galen recommended rasping of the denuded cranium.

WILLIAM C. BECK, M.D.

# INTERNATIONAL ABSTRACT OF SURGERY

DECEMBER, 1939

## PRINCIPLES OF SURGICAL PRACTICE

### RECURRENT DISLOCATION OF THE SHOULDER-JOINT

CHARLES GRAY, F.R.C.S., London, England

**O**F ALL the joints the shoulder is by far the most commonly dislocated, yet only a very small proportion of these dislocations become truly recurrent. The term "truly recurrent" is used because a clear distinction should be made between the shoulder which is subject to habitual dislocation, that recurs frequently with little and perhaps very trivial provocation and the shoulder which by an evil chance is dislocated several times by violence although it recovers without blemish from each successive incident. In the latter case the joint is normal. Each dislocation is precipitated by trauma which would cause dislocation of any shoulder joint. In the former case, the true recurrent or habitual dislocation, there must obviously be some grave defect in the mechanism of the joint which permits dislocation with almost casual facility.

The defect might be congenital, but this happens only rarely. Occasionally the first dislocation may occur as the result of very little trauma, which fact suggests some pre-existent abnormality of the joint but as a rule it presents no unusual features. Further the joint has usually functioned perfectly for many years before the series of recurrent dislocations commences. We must assume therefore that by an initial dislocation some permanent damage is inflicted, as a result of which the joint becomes weakened, so that recurrent dislocations are easily provoked. It is in patients who either voluntarily, or in the course of an epileptic attack, engage in violent muscular activity that this weakness is most likely to be exposed.

Orthopedic Registrar, The Middlesex Hospital, London.

Since the joint is formed of muscles, bones, and capsule it is clear that the flaw must lie in one of these components, and all these possibilities have received considerable attention in the literature.

#### THE THEORY OF A MUSCULAR DEFECT

Clinical examination does not support the theory that there is any muscular defect. Occasionally there is slight wasting of the deltoid muscle but as a rule the tone and volume are normal. It has been suggested that shortness of the pectoralis major and latissimus dorsi might cause dislocation by supplying a fulcrum over which the head of the humerus is forced out of the joint by abduction of the arm. Some surgeons have reported success in curing recurrent dislocation by the simple measure of lengthening these muscles (Young). However, there has been no convincing report of a substantial series of cases treated in this way and observed over an adequate period of time, and the victim of recurrent dislocation has a perfect range of active and passive movement—a fact which is incompatible with any muscular contracture.

During anterior dislocation of the shoulder the tendons of the supraspinatus and infraspinatus are, of course, stretched over the glenoid cavity. As a rule the muscles successfully adapt themselves to the abnormal position of the humeral head, but there is a large proportion of cases in which the action of the supraspinatus is affected. In fact, some disturbance of the function of the supraspinatus is the most common complication of dislocation of the shoulder. It is revealed by the familiar supraspinatus syndrome—limitation of active abduction, although passive movements

are not restricted and the deltoid muscle is not paralyzed. As a rule the muscle resumes its normal function in the course of a few weeks or months and the syndrome disappears. This transient weakness may be due to a bruise or partial rupture of the supraspinatus tendon or to a fracture of the greater tuberosity involving the facet into which this tendon is inserted. In a small number of cases the tendon is completely ruptured and unless an operation is performed to repair the rupture the supraspinatus syndrome persists and the shoulder is permanently disabled.

It has been supposed by some that the more serious types of supraspinatus lesion might account for recurrence of the dislocation. Duchenne has stated that recurrent dislocation cannot occur unless the supraspinatus tendon has been ruptured. This is certainly incorrect. Cases of recurrent dislocation do not present the supraspinatus syndrome on clinical examination and cases of supraspinatus rupture diagnosed clinically and proved at operation show no tendency toward dislocation. Further routine x-ray examination of cases of recurrent dislocation of the shoulder shows no evidence of previous fracture and it appears from this that avulsion of the upper part of the greater tuberosity of the humerus which must impede the action of the supraspinatus muscle does not predispose to recurrence of the dislocation. The supraspinatus tendon, therefore cannot be indicted.

Apart from lesions of individual muscles it has been suggested that incoordinated or abnormally co-ordinated action of the shoulder muscles as a whole might be responsible for recurrent dislocation. Perhaps a tenuous analogy might be drawn between this idea and the mechanism of pathological dislocation in arthritis. In acute arthritis of the hip joint for instance when spasm disturbs the normal balance of muscular activity the joint is maintained in a position of flexion adduction and internal rotation and pathological dislocation may occur quite suddenly at an early stage of the disease as the result of this abnormal muscular activity. With some such idea in mind Codman and Davis after him have treated recurrent dislocation by exercises intended to develop a muscular control which will prevent dislocation of the shoulder joint.

#### THE THEORY OF A BONY LESION

The conception of a muscular lesion is not convincing and at first sight it would seem far more likely that the instability of the joint could be explained by some bony defect. Flatness of the

anterior lip of the glenoid and deformities of the head of the humerus have been suggested and in some cases described, as the responsible lesions. Reich, from post mortem studies, concludes that fracture or erosion of the anterior margin of the glenoid cavity commonly occurs in dislocated shoulders. Tavernier goes at length into the subject, and nearly all authors mention bony defects either congenital or acquired as the result of trauma among the causes of recurrent dislocation. X-ray examination however usually reveals no abnormality at all. Henderson it is true mentions an occasional appearance of roughness of the articular surfaces on roentgenological examination, but there is nothing at all convincing and the most apt and destructive comment on this theory of a bony lesion came from Broca who said that '*encochee ou non il faut que la tête trouve une cavité ou se loger lorsqu'elle se relâche*'.

This '*cavité*' is the crux of the situation. When dislocation occurs the head must go some where and in recurrent dislocation it often moves forward with little or no violence behind it so that one gets the impression that there must be a space of some kind ready to receive it.

#### THE CAPSULAR LESION

As a rule, when dislocation occurs the capsule is torn. After reduction of the dislocation the torn capsule heals and the joint returns to its normal condition. In cases of recurrent dislocation this return to the normal condition is not achieved. Healing does not occur. There is a persistent lesion which has been lucidly described by Bankart who says— In its passage forwards the head shears off the fibro-cartilaginous glenoid ligament from its attachment to the bone. The detachment occurs over practically the whole of the anterior half of the glenoid rim. The reason why the dislocation recurs after reduction is that whereas a rent in the fibrous capsule heals rapidly and soundly there is no tendency whatever for the detached glenoid ligament to reattach itself to the bone. The defect in the joint is therefore permanent and the head of the humerus is free to move forwards over the anterior rim of the glenoid cavity on the slightest provocation.

From such a joint a blunt instrument can at operation be passed easily over the anterior margin of the glenoid cavity on to the neck of the scapula where it comes to rest under the subscapularis muscle in a space which is the '*cavité*' referred to by Broca.

The method by which this distinctive flaw is produced must be a subject for conjecture.

Formerly dislocation was believed to occur usually by a simple process of leverage with the arm in full elevation, the acromion process supplying a fulcrum and the shaft of the humerus acting as the long arm of a lever which forced the head of the humerus away from the glenoid cavity and through the lower part of the capsule. Bankart suggested that in those cases which subsequently became recurrent the mechanism of dislocation is not leverage but a direct drive. He believes that in this type of dislocation the violence is applied directly to the humeral head either by a blow behind the shoulder or by a fall backward on to the point of the elbow, with the shoulder joint extended. The head of the humerus is thus driven directly forward out of the glenoid cavity, and so produces the lesion already described. This theory is reasonable but in actual fact a history of this type can only rarely be obtained from the victim of recurrent dislocation.

Codman's views on the mechanism of dislocation illuminate this aspect of the problem. In the course of his study of the shoulder joint he showed that as the arm is elevated the range of rotation at the shoulder joint diminishes progressively and when full elevation has been obtained rotation is almost abolished the joint being locked in such a position that the internal epicondyle of the humerus points forward. The important point is that in any degree of elevation, and whatever the plane occupied by the humerus the range of rotation is defined by limits which are maintained so strictly that if the rotating force is continued dislocation or fracture must occur.

As an example, dislocation sometimes occurs during the manipulation of stiff shoulders, not by leverage of the shaft of the humerus against the acromion process in full elevation but before the position of full elevation has been reached. The dislocation is caused by a forcible attempt to elevate the humerus in the coronal plane without first obtaining full external rotation. The surgeon may easily convince himself by personal trial that full elevation in the coronal plane is possible only if the humerus is in the position of full external rotation, while internal rotation is necessary for full elevation in the sagittal plane. Infringement of these rules must result in dislocation or in fracture. Elevation and rotation are both of great importance in the mechanism of dislocation of the shoulder joint.

The patient with a traumatic dislocation of the shoulder is seldom able to describe accurately the mechanism by which his injury was produced, but it is clear that one possible method is by the

application of a force which violence is in the coronal plane while the shoulder joint is in a position of internal rotation. Again, a shoulder joint may be dislocated with the arm in any degree of rotation and dislocation becomes easier as rotation is varied because the limits of rotation are correspondingly restricted. Rotation in adduction leveraged seems to be the mechanism which dislocation is, as a rule, a theoretical grounds rotation would be capable also of producing the type of lesion which leads to recurrence of dislocation. At any rate this mode of injury may occur as that from the direct cause of Bankart.

Whatever its cause, the essential feature of the lesion is its permanence. It indicates an important principle, namely, no dislocation of the shoulder joint complicated by fracture, nerve injury, or to the tendons should be treated as a simple movement may be permitted. If dislocation has been reduced, recovery will be accelerated if the dislocation is of the ordinary type, and if the lesion which leads to recurrence is present, no harm is done by such a lesion cannot be mobilized of the joint. It is a surgical measures.

Bankart's views have been accepted because he has established the permanent dislocation of the shoulder joint. He has operated on each of which the typical lesion is obvious. The lesion is obvious in the operation, and it has been spread recognition of the lesion required to express the times difficult.

Many surgeons have observed that the lesion Perthes and Bankart's lesion is unlike that of Bankart's lesion. The lesion is obvious in the operation, and it has been spread recognition of the lesion required to express the times difficult.

Many procedures for the treatment of recurrent dislocation of the shoulder joint, and most of them, their authors on almost uniform basis.

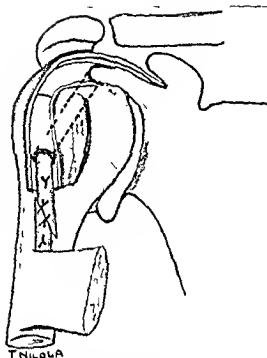


Fig. 1. Showing new course of long head of biceps through head of humerus (Nicola J Bone & Joint Surg 1934 16 663)

Codman's method of treatment by means of exercises to improve the muscular control of the joint and Young's operation to lengthen the pectoralis major and latissimus dorsi have already been mentioned. They are not much used. Clairmont's muscle sling operation which was once popular has been discarded because it is both difficult and unreliable.

The bone block operations are still in use but by a decreasing number of surgeons. The principle is simple. A bony block is introduced in front of the shoulder joint to prevent forward movement of the head of the humerus. Some surgeons use a tibial graft implanted into the neck of the scapula (Eden Speed Hildebrand). Bazy and Calvet base the graft on the coracoid process. Oudard divides the coracoid process obliquely and by sliding the two portions on one another increases its length in a downward direction. This operation is combined with plication of the capsule. The bony block is provided by the elongated coracoid process. An obvious objection to the bone block operations is that the joint must continue to be vulnerable during the considerable time which will elapse before the graft has taken firmly.

The "sling" operations of which there are several varieties, are the most widely used. The principle of these operations is very simple. A strip of living suture material is used to tether or support the head of the humerus, the proximal end being attached to the scapula.

Henderson uses a piece of peroneus longus tendon. One half of the tendon is removed from the leg over a distance of several inches and is then passed through drill holes in the surgical neck of the humerus and in the acromion process to form a loop which suspends the head of the humerus from the acromion process.

Nicola exposes the long head of the biceps and severs it at its junction with the muscle belly. He then drills a tunnel in the head of the humerus starting below at the lower end of the bicipital groove and emerging on the articular surface about  $\frac{1}{2}$  in from its upper end. After its surface has been roughened the tendon is passed through this tunnel from above downward and its distal end is reuniting to the muscle belly by sutures. Nicola stresses the point that the upper end of the tunnel must be a good  $\frac{1}{2}$  in from the margin of the articular surface because he believes that otherwise the tendon will be unable to control the head of the humerus when the arm is in full abduction.

Roberts has modified Nicola's operation. He does not drill a tunnel in the head of the humerus but merely deepens the bicipital groove.

Hey Groves uses a piece of fascia lata and passes it underneath the shoulder joint from front to back.

All these sling operations are designed to give stability by the introduction of artificial ligaments which have no parallel in the natural state of the shoulder joint. The two operations which remain to be described fall into a different class. Their principle is contained in a remark made by Gallie when in considering dislocations in general, he said. The chief point of the matter is that if operative treatment for these injuries has been decided upon the anatomy of the part must be reviewed carefully and that technique decided upon that will enable the surgeon to restore both the anatomical structure and the function of the injured ligament most perfectly.

Now Gallie believes that recurrent dislocation of the shoulder joint is caused by a defect of the inferior glenohumeral ligament as mentioned before and he therefore treats the condition by the introduction of a new inferior glenohumeral ligament which will prevent the head from sliding downwards and forwards when the appropriate leverage is applied. The shoulder joint is



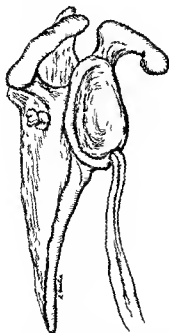


Fig 2

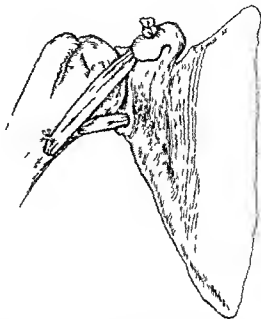


Fig 3

Fig 2 Drawing of scapula to show how the new inferior glenohumeral ligament is attached to the bone. Fig 3 Operation completed with new inferior glenohumeral ligament in place and finally attached to tip of coracoid process (Gallie New England J Med 1935 213 91)

exposed by an anterior incision. The deltoid and pectoralis major are separated. The muscles arising from the coracoid process are retracted inward and the subscapularis is retracted upward and inward, the anterior aspect of the shoulder joint being thereby exposed. Four holes are then drilled, one in the coracoid process, one in the neck of the scapula, and two in the neck of the humerus. Through a stab wound behind the shoulder a piece of fascia lata with a knot in one end of it is drawn forward through the hole in the neck of the scapula, until the knot comes to rest on the posterior surface of the neck of the scapula. The strip of fascia is then passed through the holes in the neck of the humerus and in the coracoid process (see Figs 2, 3). The new ligament is drawn to such a tension that when healing has occurred, abduction and external rotation of the joint will be slightly limited.

Bankart's operation is directed to the repair of the lesion which he has shown to be the real cause of recurrent dislocation. Through an anterior incision the deltoid and pectoralis major are separated. The coracoid process is divided with an osteotome, and the tip is then reflected downward together with the three muscles which are attached to it. The subscapularis tendon is thus exposed, and is divided. The anterior aspect of the shoulder joint is thus brought fully into view. The anterior margin of the glenoid cavity

is always found to be "smooth, rounded, and free of any attachments, and a blunt instrument can be passed freely inwards over the bare bone on to the front of the neck of the scapula." The neck of the scapula is then roughened by raising a thin flake of bone from it with an osteotome. With a right angled drill, driven by an electric motor, four holes are drilled from the raw surface on the front of the neck of the scapula to the cartilaginous surface of the glenoid, and through these holes two mattress sutures of silk worm gut are passed, which reattach the free edge of the capsule (and the glenoid ligament) to the bone.

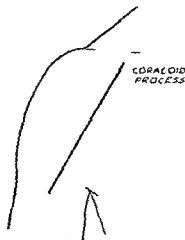


Fig 4. The incision (Bankart operation)

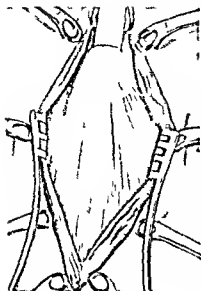


Fig 5

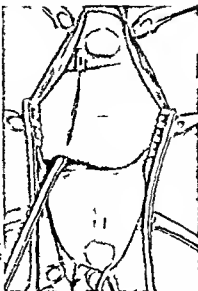


Fig 6

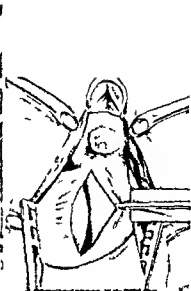


Fig 7

Fig 5 The deltoid and the pectoralis major muscles have been separated showing the coracoid process and the three muscles attached to it. An osteotome has been applied to the upper surface of the coracoid process.

Fig 6 The coracoid process has been divided and the detached portion has been drawn downward with the muscles attached to it. The tendon of the subscapularis is seen with an aneurysm needle passed beneath it. The tendon has been partially divided.

Fig 7 The tendon of the subscapularis has been divided and the muscle has been retracted inward. A transverse opening is seen in the capsule of the joint, the outer edge of which lies on the head of the humerus while the inner edge which includes the glenoid ligament has been raised by a hook from the anterior margin of the glenoid cavity. Note that the glenoid margin is smooth and rounded (Bankart operation).

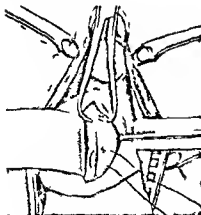


Fig 8

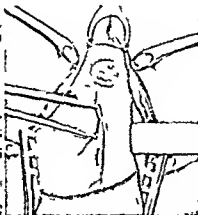


Fig 9

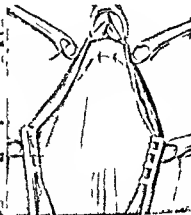


Fig 10

Fig 8 A thin shaving of bone has been raised from the anterior margin of the glenoid cavity and the neck of the scapula. Three holes have been made in the glenoid margin and a pair of vulsellum forceps is seen in the act of making a fourth hole. A suture has been passed through the two holes in the lower half of the glenoid margin and the two ends of this suture are seen emerging from the raw surface on the front of the neck of the scapula.

Fig 9 The free edge of the capsule has been drawn inward and placed on the raw surface of bone in front of the

glenoid margin and neck of the scapula. The two sutures have been passed through the edge of the capsule. The lower suture has been tied and is shown with its ends cut short. The upper suture is being tied with two pairs of forceps.

Fig 10 The subscapularis tendon has been sutured with catgut. The detached portion of the coracoid process has been replaced and is shown held in place by two sutures of silkworm gut. (Figs 4-10 inc.—Bankart Brit J Surg 1938 6 23)

The subscapularis tendon is sutured with catgut, and the coracoid process is repaired with silk worm gut or with wire. After this operation the arm must be bandaged to the side for one month.

#### RESULTS

It appears from the literature that nearly all the operations described in this paper give very good results. Nicola reports 37 cases, with only 1 recurrence, which was due to violence so severe that it probably ruptured the tendon of the long head of the biceps. Horwitz and Davidson report 25 cases in which Nicola's operation was performed. Of these 20 were followed up, and in 17 the operation was found to be completely successful. Hey Groves has 10 cases, 9 of which showed successful results. Henderson records 29 cases, of which 27 presented perfectly successful results. Gallie had 33 perfect results among 35 cases. Bankart has performed his operation on 30 patients and there have been no recurrences, nor any restriction of movement in any of these cases. Moseley traced 8 of a series of 10 cases on which Clairmont's operation had been performed. Only 2 showed completely successful results. Two patients had suffered frequent recurrences. The remaining 4 patients had recurrences soon after the operation, but not subsequently.

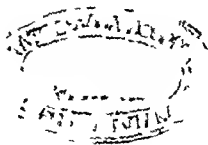
Nicola's operation is the most popular at the present time. The idea is ingenious and fairly simple to execute. Henderson's technique has the disadvantage that it requires an operation upon the leg. The operations of Gallie and Bankart have not received much attention, possibly

because the glenoid margin is so far from the surface. The dissection is certainly extensive, but it is straightforward. Bankart's operation, in particular, since it is a direct attack on the pathology of recurrent dislocation, should be more widely used.

NOTE—This review has been concerned only with anterior dislocations, because posterior dislocations, either solitary or recurrent, are very rare indeed.

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# ABSTRACTS OF CURRENT LITERATURE

## SURGERY OF THE HEAD AND NECK

### HEAD

Brosch F. Suppurative Inflammations of the Jaw (Ueber eitrige Kieferentzündung) *Ztschr f Stomatol* 1939 37 172 234 303

On the basis of anatomical material derived from 6 briefly described clinical cases of suppurative inflammation of the jaw the pathological changes in the tissues were exhaustively discussed. The disease in its widest meaning includes pyogenic infections of the jaw bone as well as of the soft tissues. The discussion concerns first the disease of the bone its destruction and the extension of the infection also the process of sequestration and the fate of the sequestrum then the changes in the paradentium and the influence of the disease upon the pulp of the tooth. Finally a critical analysis based upon the results of these studies is given of the usual treatment particularly the surgical of the frequent small bone abscesses. The very lengthy work is illustrated with numerous photomicrographs and includes a brief review of the literature.

It has been shown that the destruction of bone occurs as a lacunar resorption and necrosis with subsequent sequestration. The immediate cause of the former is the increased tissue pressure during the first phase of the disease produced by the inflammatory changes in the marrow cavity. Locally produced destructive processes are in the background at first. Near a larger zone of lacunar destruction there is a smaller one of suppurative tissue liquefaction. This shows that dissolution of the bone by pus does not occur. There is however the possibility of bone sequestration from the action of toxins. Nevertheless most of the cases of sequestration develop as bland bone necroses with secondary infection. The complete infiltration of a region by toxins would not account for pieces of bone with a uniformly necrotic appearance yet which retain at their margins cells ranging in all stages of viability to complete destruction. Bland bone necroses arise presumably from disturbances of nutrition which are only indirectly associated with infection. Severe vascular damage is demonstrable in the vicinity of the dead bone. The bone marrow also sustains tissue damage which leads to hemorrhage and fat is the subsequent suppurative liquefaction.

In the healing stages of the disease the secondarily infected sequestra are unquestionably the foci of infection. Their infectiousness persists long after the disease has healed. Detoxification occurs slowly by diffusion of the toxins. Only then do the sequestra become restored or replaced. Finding large unaltered and unabsorbed sequestra may lead to the assumption that entirely healthy bone died from the

effect of toxins. It was shown that such toxins could not have been overwhelming but that certain prerequisites for lacunar resorption were lacking. Smooth necrotic margins do not justify the belief that the bone destruction resulted from general agents such as pus. The finding of remains of osteoclasts indicates destruction superimposed upon lacunar resorption.

The first layers of periosteal involucrum formation are immediately superjacent to the surface of the necrotic bone. The new growth does not occur in the periosteum which has been elevated by the pus. The separation of the sequestrum from the involucrum takes place among other phenomena by means of vascular resorption. The bone also seems to be able to reconstruct its central portions after severe damage. The apical portion lags behind the marginal in this regard. Tissue zones which remain infected become encapsulated from those which have already healed.

Loss of substance of the tooth is greater in the apical portion than in the marginal. Reparation by the deposition of cement is complete throughout. The connective tissue paradentium succumbs very largely in its apical portion to the suppurative liquefaction but the marginal part remains completely intact although it loses its functional structure. There are intimate connections between tooth and alveolus. Loosening of the teeth during the disease is not due to dissolution of the root membranes but to loss of the alveoli as supports. Tooth tissue surrounded by suppuration is able, within a short time to participate in reconstruction and to become reimplanted in healthy tissue without reaction.

For the persistence of infectious processes in the neighborhood of teeth including periapical foci it is not the teeth but damage to other tissues that is responsible. The possibility of retaining viable pulp in the infected area is slight. Suppuration necrosis and fibroreticular atrophy occur.

Circumscribed bone involvements in inflammations of the jaw should be called bone abscesses rather than osteitis. Separation of periapical bone abscesses from other inflammatory jaw bone diseases is not logical. Extraction of the teeth in inflamed tissue constitutes the immediate trauma that results in inflammation of the jaw. The retention of the teeth in spite of infection and changes in the tissues in periapical bone abscesses indicate that in resections of the root tips the emphasis of treatment is to be placed on the bone and not on the teeth. As in sequestromy flattening of the bone margins should be considered a factor which favors healing. (HEINEMANN GRUEDER) LEO M. ZIMMERMAN M.D.

## EYE

Guyton, J S The Use of Sulfanilamide Compounds in Ophthalmology *Am J Ophth*, 1939 22 833

An excellent and inclusive review of the present status of sulfanilamide compounds in general medicine, and their use in ophthalmology, is included in this article. Previous reports indicate that these drugs are of value in the treatment of gonococcal conjunctivitis and trachoma, of probable value in the treatment of inclusion blennorrhoea, and of possible value in certain cases of panophthalmitis, cavernous sinus thrombosis, herpes simplex, and herpes zoster. The reported successful use of proniosin solution in the eye is doubted, although a solution of sulfanilamide itself may have potential value.

The cases of 43 patients treated with sulfanilamide compounds in the Johns Hopkins Hospital because of ocular inflammations are reported. The results obtained were as follows:

1. No appreciable effect was noted in 14 cases of 'gonococcal' uveitis, in which type of condition the author has obtained spectacular results with induced hyperpyrexia.

2. No apparent benefit was obtained in 5 cases of ocular tuberculosis.

3. Four of 8 cases of purulent intra ocular infection exhibited spectacular cures. In 1 of these the infection was found to be a metastatic meningococcal panophthalmitis, 1 was a postoperative panophthalmitis with the beta streptococcus in the anterior chamber, 1 was a postoperative panophthalmitis with the staphylococcus aureus in the conjunctival sac, and the fourth was a postoperative endophthalmitis of unknown cause.

4. Significant results were obtained in 5 cases of infection of the lids or orbit, 4 of the cases were known to be due to the beta hemolytic streptococcus.

5. Improvement was noted in 2 cases of trachoma in the third stage, 2 other cases of trachoma showed more marked improvement following the intra venous administration of tartar emetic.

6. Two cases of inclusion blennorrhoea were cured within six days.

7. A cure of doubtful significance was obtained in 1 case of pneumococcal conjunctivitis and corneal ulcer by the use of sulfapyridine.

8. One case of corneal ulcer associated with streptococcal and staphylococcal conjunctivitis responded significantly.

9. No appreciable effect was noted in 5 miscellaneous cases.

WILLIAM A. MANN, M.D.

Stokes W H Transplantation (Implantation) of the Lacrimal Sac in Chronic Dacryocystitis *Arch Ophth* 1939 22 193

The advantages of dacryocystorrhinostomy as compared to those of extirpation of the lacrimal sac are widely recognized, although the technical difficulties of performing the first operation are frequently the reason that dacryocystectomy is per-

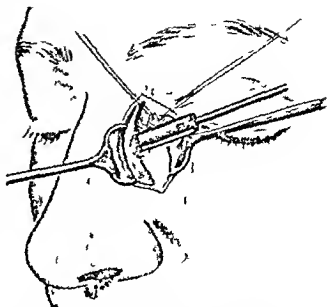


Fig 1 A trephine 8 to 10 mm in diameter with a center pin is applied to the bone toward the lower part of the ascending process of the maxilla.

formed. The technique of implantation of the lower end of the tear sac into the nose as successfully reported by Sinks, includes the usual local anesthesia, an incision half way between the inner canthus of the eye and the side of the nose, at least 12 mm from the inner canthus, elevation of the periosteum and exposure of the sac, freeing of the sac to the entrance of the canal where it is cut, introduction of silk sutures in the wall of the sac, perforation of the bone with an 8 to 10 mm trephine with a center pin, removal of the trephined bone and nasal mucous membrane, destruction of the mucosa of the old nasolacrimal duct and passing of the sutures in the wall of the sac through the new opening into the nose when they are drawn through the nostrils and fastened to the skin of the cheek with adhesive. The sutures are removed on the sixth day. This technique obviates the difficult suturing of the lacrimal sac wall to the nasal mucous membrane required in several of the more popular types of operations, and, according to the author is sufficient to obtain a satisfactory result, that is, freedom from epiphora and other symptoms referable to the eye. The author has not found it efficacious in the small atrophic type of sac or when slitting of the canaliculi has been performed previously. Emphasis is placed upon removal of the nasal impediments.

A complete table of patients operated on by this method is included in the paper.

WILLIAM A. MANN, M.D.

Buxton, R The Intracapsular Extraction of Cataract with Forceps. Is Its Use Justifiable? *Brit J Ophth*, 1939, 23 505

Of the various methods of intracapsular extraction, namely Smith's expression method, Barraquer's

suction method electrocoagulation of the lens, and forceps extraction the author discusses the last. It would take much space to compare these methods and the technique of the forceps method is probably the easiest to acquire and as Kirwan recently stated the least dangerous.

Wright has recently written that even after years of consideration and vast experience it is uncertain whether intracapsular extraction is better than extracapsular extraction when the latter is well done. An eye with its zonula capsule barrier intact provided that the vision is good is *prima facie* a better eye than one in which it is not intact.

A ruptured capsule is common and unpleasant. It is not serious if the capsule bursts at an early stage in the tumbling operation. If it occurs when the suspensory ligament is only partly broken and masses of soft lens matter escape or if vitreous prolapse occurs a dense after cataract forms.

A ruptured capsule brings the risk of iritis, secondary glaucoma, or generalized infection of the eye. This complication varies according to (1) the type of cataract (2) the type of forceps (3) the age of patient and (4) the operator's technique and skill. Castroviejo held that there was a decreasing chance of success in the following list: (1) soft cataract (2) immature cataract and uncomplicated cataract (3) nuclear cataract (4) Morgagnian cataract (5) black cataract and (6) intumescent cataract.

Any conditions which hinder the delivery of the lens are likely to cause rupture of the capsule. These include a too small corneal section, a section finishing in the cornea and not at the limbus, a relatively large lens with a relatively small cornea, mydriasis less than 7 mm., the use of unsuitable forceps, careless introduction of the forceps, the grasping of a piece of capsule more or less than 2.5 mm. wide, hurrying of the lens extraction, both before and after the lens has started to tumble, too much traction instead of pressure from below when the lens has started to tumble.

Vitreous prolapse is a very undesirable complication. It predisposes toward infection, iridocyclitis, secondary glaucoma, vitreous degeneration which may diminish visual acuity, probable detachment of the retina, choroidal hemorrhage and according to Knapp a toxic optic neuritis.

Corneal opacities are a complication which is comparatively common in intracapsular work. If intracapsular extraction is complicated by ruptured capsule or prolapse of the vitreous, glaucoma may follow.

There is a rather greater likelihood of hyphema in intracapsular extraction than in extracapsular extraction.

There is less likelihood of iritis and iridocyclitis in an uncomplicated intracapsular operation for cortical remnants and capsular tags which may cause trouble are absent.

In the absence of complications, infection is probably less frequent and more benign in the intracapsular operation.

It is sometimes held that one of the greatest bugs of the operation is the increased risk of the occurrence of retinal detachment afterward.

The patient should be co-operative and should not be nervous or restless. The operation is contra-indicated in very old or deaf patients who cannot be relied upon for co-operation. One-eyed patients should have the extracapsular operation.

It is probable that fifty-five years should be the lower age limit, with possible exceptions in the case of low myopia and cataract following iridocyclitis. A patient of advanced age, unsuitable because of temperament or general or ocular disease, will of course contraindicate the operation. There is an added risk of vitreous prolapse. The risk is increased when the zonula is excessively friable or even dehiscient in part and fluid vitreous may have found its way into the posterior chamber. Vascular disease is more common in the aged, with an increased risk of choroidal hemorrhage. It is suggested therefore that the operation should not be performed when the patient is more than eighty years old.

General disease, e.g., cardiovascular renal disease, elevation of the blood pressure, or marked arteriosclerosis, renders the operation unsuitable by increasing the risk of complications. Diabetes when controlled is not a contraindication, however the lens matter after extracapsular extraction may set up unpleasant iridocyclitis in the presence of diabetes. Cough, asthma, an enlarged prostate, piles, mental affections, cardiac failure, habitual sneezing, cystitis, or vaginal discharge which gives rise to straining, renders a patient unsuitable for operation. Goodman, in an article on endophthalmitis phaco-anaphylactica, recommends intracapsular extraction in all favorable cases when there is any reaction to the cutaneous test with lens protein.

In local disease, such as myopia, there is a greater risk of prolapse of the vitreous, especially in the higher degrees of myopia. If vitreous prolapse should occur, there is a possibility of detachment of the retina, secondary glaucoma, organization of the vitreous, or drawn up pupil. It is probably wiser not to perform intracapsular extraction in exophthalmos. If eye tension is within normal limits, glaucoma is no contraindication to the operation.

In certain types of cataract and in complicated cataract, the triumph of the intracapsular operation may be seen. All authorities appear to be agreed that intracapsular extraction is not indicated for intumescent cataract. In traumatic cataract and dislocated cataract, it is possible that the hyaloid membrane and zonula are weak or have ruptured, and if so vitreous prolapse is likely. All authorities are agreed that the immature cataract is the most suitable type for the intracapsular method. There is little doubt that the mature cataract is a suitable condition for intracapsular extraction.

One of the most important details in intracapsular work is satisfactory mydriasis.

For anesthesia of the conjunctiva, various concentrations of cocaine, with or without adrenalin,

are popular, e.g. cocaine 4 per cent with adrenalin 1:3,000, 6 instillations of 2 drops at two minute intervals, with 1 drop in the other eye are given.

Retrobulbar anesthesia is of great value in intra capsular work. However, there are a number of disadvantages. It requires more time, there is a slight risk of retrobulbar hemorrhage, which causes alarming proptosis and necessitates postponement of the operation, the softening of the eye may be so marked that the capsule is difficult to grasp with the forceps, if the extra ocular muscles are paralyzed, the patient cannot fix properly the adrenalin in the injection fluid sometimes causes complete temporary amaurosis from contraction of the retinal blood vessels, there is an increased risk of bleeding from the conjunctival flap.

For the anesthetic solution various concentrations of novocaine and adrenalin are commonly used.

As to corneoscleral suture few operators who use the intracapsular method will question the value of some kind of suture for securing the corneoscleral wound firmly.

The advantages of suture are (1) control of the wound (2) immediate and firm coaptation of the wound as soon as the suture is tied (3) quick reestablishment of the anterior chamber and considerable decrease in the liability of the iris to prolapse. Further the rare and serious complication of reversed corneal flap is obviated. The suture protects the wound after operation. This is especially important in elderly patients who should move about and get up early. The risk of postoperative hyphema is very considerably lessened by suture. Suture is also an aid to fixation and to the introduction of the capsule forceps. Postoperative astigmatism tends to be reduced following suture. A superior rectus suture is an added precaution.

A self retaining speculum which does not press upon the eyeball is essential. Fixation of the red lamp is to be recommended.

The incision should be larger than usual and extend just above the horizontal diameter of the cornea at the limbus and finish with a narrow edge of conjunctiva.

With intracapsular extraction without tumbling, it is almost essential to perform a complete iridectomy in order to grip the upper border of the lens correctly. However, recently in America a pair of forceps has been devised with a heel for raising the pupillary border of the iris which obviates the necessity for iridectomy.

It is important that the forceps should be so made that the blades are in exact apposition to each other that the grip is of equal strength all along the blades, and that they have no roughness which might cause tearing of the capsule. The introduction and grasp of the forceps should be done with the greatest gentleness.

In the postoperative treatment both eyes are bandaged for forty eight hours. After twenty four hours a drop of 1 per cent atropine is instilled into the eye which has been operated upon. This eye

is dressed, and 1 per cent atropine is instilled daily into it until the eye is white. Dark glasses should be given on the eighth day and spectacles at the end of six weeks.

LESLIE L. MCCOY, M.D.

## EAR

Scott P. Colledge, L., Woodman M., Ormerod F. C. and Others. Discussion on Malignant Disease of the Ear (Excluding the Pinna). *Proc Roy Soc Med*, Lond, 1930, 32: 1087.

SCOTT. This paper is an analysis of 70 cases of malignant disease of the ear. Among the factors which may arouse suspicion of malignancy are toughness of the granulations when touched with a probe, recurrence after removal and a tendency to bleed easily. Persistence of meatal infection in spite of cleansing treatment, pain on chewing, and the presence of granulations or papillomas attached to the deep meatal wall. Malignant disease of the ear is divided into four groups: carcinoma, sarcoma, rodent ulcer and endothelioma. Carcinoma is by far the most common type of malignant disease to affect the ear, and may be primary or secondary.

Primary carcinoma, almost always squamous cell in type, may be identified by early or late involvement of the tympanum. It is believed that all squamous carcinomas arise somewhere in the fundus of the external meatus and spread inward to involve the tympanum early. The meatus appears to be the starting point in the majority of instances. In another group of cases the tympanum is not involved until late in the disease. In the first group the symptoms are those of chronic suppurative otitis media while in the second the symptoms are more commonly those of a severe otitis externa—pain, irritation and discharge.

Sarcoma and endothelioma present few features which, apart from histology, serve to distinguish them from carcinoma. Rodent ulcer shows a slower rate of growth. Treatment by surgical measures may be divided into two essential types: (1) meatal operation, and (2) radical operation. When there is an ulcer in the meatus without any apparent involvement of the tympanic membrane or past history of chronic suppurative otitis media, sleeve resection of the meatus, with the skin of the bony meatus and in some cases the pinna, has been carried out with some measure of success, especially if followed by some form of radiotherapy. However when there is the slightest doubt about the integrity of the drum membrane or if chronic otitis media has preceded the onset of malignant disease, radical mastoid operation together with meatal excision should be performed. Subsequent diathermy or radiotherapy may be employed. In 26 of the 70 cases under discussion, complete surgical excision alone was carried out, complete surgical excision combined with diathermy was done in 10 cases, complete surgical excision combined with radiotherapy in 14 cases, radiotherapy alone in 10 cases, and treatment was not recorded in 10 cases.

**COLLIDGE** This author gives a composite account of the clinical and pathological features of carcinoma of the middle ear. In defining malignant disease it is necessary to include the petrous portion of the temporal bone and the deeper portion of the external auditory meatus but disease of the pinna itself is expressly excluded. A long history of chronic otorrhea preceding the development of the tumor usually occurs but not always. It is natural to regard malignant disease in the temporal bone as a primary manifestation but it may arise even more rarely as a secondary condition from a carcinoma in some common situation such as the breast. The most common type of tumor arising in this location is the squamous-celled epithelioma with keratinization. The clinical course of malignant disease in the temporal bone seems to involve relatively easy spread through the bone with enormous destruction. In the matter of diagnosis the comparative rarity of the disease is likely to cause it to be overlooked at an early stage. Granulation tissue without suppuration or spontaneous bleeding may arouse suspicion so that early diagnosis can be readily made by biopsy. The prognosis is naturally grave. Provided the growth is still in a reasonably early stage and has not advanced to the stage of diffuse infiltration the best treatment is excision.

**WOODMAN** This author discussed 7 cases of malignant disease of the ear seen during the period from 1930 to 1938. Four of the patients were dead and 3 were alive and free from recurrence. The analysis of the fatal cases was perhaps more interesting than the record of the successful ones. Of the 4 patients who died 2 died of extension of the disease through the tympanic membrane into the middle ear and 2 of the invasion of the parotid gland and the brain through the parietal region. Radon, the radium tube and the radium beam had proved almost useless. In not 1 of the 3 successfully treated cases had radium or any like agent been able to check the disease. On the other hand diathermic excision in combination with prophylactic radiation afterward had proved successful. The excision must be as adequate and complete as possible.

**ORMEROD** One case included in Scott's list was treated by operation in 1928 and later by insertion of radium needles. There was complete disappearance of the tumor for one year. It then recurred and a sleeve resection was performed without any further use of radium and the condition cleared up. It is now ten years since the surgical operation. The radium failed to cure the condition but sleeve resection was effective.

**MCCAY** A case was discussed which showed how easily a carcinomatous condition of the ear might be missed in a patient who had had a radical mastoid operation for recurring aural polyps. The polyps recurred years later and histological examination showed the condition to be a basal cell carcinoma.

**TILLEY** It was Tilley's custom to teach students to be suspicious of malignant disease of the tympanic

regions when an adult complained of deafness, deep-seated pain in the ear and a foul stained secretion which had developed without any preliminary constitutional symptoms of infection of the middle-ear cleft.

**MOLLISON** Microscopical examinations were sometimes misleading according to Mollison. He mentions a case to illustrate this point.

NOAH D. FABRICANT, M.D.

## NOSE AND SINUSES

**Weiss, J. A.** Scleroma (Rhinoscleroma). Histological Changes Following Telerradium Therapy. Review of Scleroma in the United States. *Arch. Otolaryngol.* 1939 30 38.

The author contributes 2 cases of nasal scleroma to the 58 cases previously reported in the American literature. Recognized by its more frequent occurrence in the foreign born, the great chronicity of its course, the hardness of the lesions, the absence of pain, ulceration or systemic involvement and by the eventual cicatricial deformities with stenosis scleroma challenges any one single method of management for a uniformly successful control. Oral medication, intravenous chemotherapy, local application of caustics, electrocoagulation, foreign protein therapy, intubation and surgical intervention have proved futile or only partially successful.

Weiss believes that telerradium therapy with higher doses will eradicate circumscribed scleromatous lesions and in all probability prevent recurrences. In his first case distance irradiation with a dose of 32,000 mgm. hours effected complete regression of the lesion. Subsequent surgical correction of the nares was required. During a period of two and one half years no recurrence was observed. In the second case excision of a small nodule was followed by prophylactic irradiation with a dose of 20,000 mgm. hours. One year has elapsed without recurrence of the lesion.

The histological changes in scleroma following intensive irradiation include extensive fibrosis, increased hyalinization, decreased cellular content of the stroma and disintegration and disappearance of the Mikulicz cells.

NOAH D. FABRICANT, M.D.

## MOUTH

**Whelan, M. G.** Plasmocytoma of the Tongue (Plasmocytome de la langue). *Bull. et mém. Soc. méd. d'Als. de Par.* 1939 55 908.

A plasmocytoma of the tongue in a fifty eight-year old male is reported. The initial symptoms were prickling sensations followed by increasing pain which later became incapacitating. There was extreme general fatigue and a loss of 20 kgm. in weight.

The patient was first seen six months after the onset of the symptoms. The tongue was garnet red in color and tripled in size with most of the enlargement on the right side. There were irregular ulcers



tions on the right side with many small yellow nodules the size of a pinhead. The left border was indurated and on the superior surface in this region there was a rounded sessile elevation the size of a franc. There were 3 small papular, ulcerated lesions on the mucosa of the left cheek near the angle of the mouth and there was a bilateral submaxillary lymphadenopathy in which the nodes were hard mobile, and not tender. No tubercle bacilli were found. The patient gave no history and had no clinical signs of syphilis and the serology was repeatedly negative. In the initial blood count there were 34,600 leucocytes with 87 per cent polymorphonuclears, 7 per cent monocytes, 4 per cent lymphocytes, and 2 per cent plasmacytes.

In spite of the lack of luetic findings the lesion so closely resembled a gumma that a course of antiluetic therapy was tried. No result was obtained, so x-ray therapy was given. With this the pain decreased, the tongue became less violaceous, the submaxillary glands decreased in size and the patient was able to eat.

Several months later the patient died of a spreading erysipeloid infection of the head and neck. At autopsy, the tumor was found in the local region including the tongue and cheek and in one small implant in one kidney. Sections of the tongue lesion showed it to consist almost entirely of plasmacytes growing in a connective tissue stroma. The tumor cells had replaced the submucous layer, in many areas being covered only by a thin layer of epithelium. In their downward invasion they separated the muscle fasciculi. The plasmacytes had typically round nuclei with eccentric granules and ovoid or trapezoid cytoplasm. There were sometimes 2 nuclei which were equally eccentric or even 3 in which case they occupied the periphery of a more voluminous cell. Several rare cells with 4 hypertrophied nuclei were seen, the nuclei being tripled in size and the cell correspondingly enlarged. The implants in the pericardial nodes appeared much the same, except that the connective tissue reticulum was much more marked and in places appeared alone. Around the periphery, there were a few cells of the reticulum in which the nuclei had multiplied and hypertrophied and somewhat resembled the cells of Sternberg. In a few areas there had been mass necrosis of the tumor cells which gave an appearance suggesting caseation, but in one area a true fibrocaseous tubercle was clearly demarcated from the necrotic tumor material.

The author notes that plasmacytoma is not a frequent tumor and is usually observed in the bones.

FRANK McDOWELL, M.D.

## NECK

Straus F. H. Woody Phlegmon of the Neck. *Surg. Gynec. & Obst.* 1939 6 230

In certain patients chronic low grade phlegmon of the neck appears to constitute a clinical entity. The process is viewed as an altered response of tis-

sue to an attenuated infecting agent. The pathology is one of simple fibroblastic proliferation. No deaths occurred in the 6 cases described. Differentiation from known infections is discussed. The course of this condition is totally different from that of the rapidly progressive pyogenic phlegmons of Ludwig's angina. Surgery is not valuable except to relieve respiratory obstruction. PAUL STARR, M.D.

Lehsman E. P., and Shearburn E. W. Thyrotoxicosis Including a Study of the Duration of Pre Operative Treatment. *Ann. Surg.* 1939 109 712

The length of the pre operative treatment of thyrotoxic patients is determined by a vaguely defined condition for which objective criteria are lacking. Possibly the longer the pre operative treatment is—within reasonable limits—the better the operative result. The authors examined their material with this question in mind.

The report concerns 401 cases of goiter, of which 290 were toxic. Two hundred and thirty one of the patients were females including 47 colored, 59 were males, including 6 colored. The highest incidence of diffuse goiters lay between the ages of thirty one and forty and for nodular goiters between forty one and fifty. The pre operative treatment consisted of bed rest, high carbohydrate diet, sedation and the administration of Lugol's solution (usually 15 drops 4 times a day). Recurrence took place in 39.7 per cent of all the cases, the percentage being higher in the negroes. The total mortality was 2.41 per cent, 0.84 per cent for the whites and 9.43 per cent for the colored.

Only 1 patient died of a thyrotoxic crisis and 1 of congestive heart failure. The authors emphasize that thyrotoxicosis is highly fatal in the negro as previously reported from New Orleans.

In charting the length of the pre operative treatment against the postoperative result the authors find that there was no relation between its length as compared to the postoperative reaction nor between the basal metabolic rate and the postoperative course. There was no discernible correlation between the initial severity or the initial basal metabolic rate and the postoperative course, not even if diffuse and nodular goiter were considered separately. There does not seem to be any value in prolonging the pre operative treatment. It is probable that thyrotoxicosis is a cyclic disease and the postoperative course is determined by the time the preparation begins. FRED S. MODERN, M.D.

Martin J. D. Jr. and Elkin D. C. Hurtle Cell Tumors of the Thyroid. *Ann. Surg.* 1939 110 169

Three tumors of the thyroid gland are described with accompanying photomicrographs. One of them was clinically malignant. They resembled Hurtle cell tumors.

A brief review of the literature is given. No biochemical studies were made. PAUL STARR, M.D.

Zukschwerdt L. The Present Status of Surgery of the Parathyroid Glands (Der gegenwaertige Stand der Chirurgie der Epithelkoerper) 63 *Taf. d. deutsch Ges f Chir. Berlin* 1930

The stormy development of functional surgery has so enlarged the indications for surgery of the normal parathyroid glands that a critical review is indicated. A prerequisite is a knowledge of the physiology which is based upon the study of function deficiency of the parathyroid glands. The animal that lacks parathyroid loses its ability to excrete soluble phosphate in the urine. For excretion through the bowel the formation of tricalcium phosphate and the presence of sufficient calcium are essential. The lack of calcium is due to retention of the phosphates. The effect of parathyroid hormones upon phosphate metabolism is based neither upon the lowering of the kidney function for phosphates nor upon the direct effect on the osteoclasts but rather upon the formation of a soluble but non ionized calcium phosphate combination due to the catalytic effect of the parathyroid hormones.

At the present time it is necessary to suspect tetany poisoning. The neurological symptoms of tetany arise neither from the brain nor the spinal cord but from the neuromuscular fibres. This has been shown by cross circulation experiments. Blood calcium determination is most desirable as a functional test of the parathyroid and blood phosphate determinations are very important since the contradictory relationship to blood calcium points to parathyroid disease. Determination of the potassium and calcium balance, the phosphate and the magnesium level and interferometry have no practical value. The time factor however seems to be of value. The continued determination of the blood-calcium in rabbits according to Hamilton's method following peroral dose of calcium and the injection of 10 cc. of the patient's blood appears to have significance.

In the treatment of parathyroid insufficiency the author first mentions transplantation a procedure which is now receding into the background. This step is indicated when both the hormone and A. T. 10 are ineffective or when the medication is too expensive for the patient. The sovereign remedy in the treatment of parathyroid deficiency tetany is A. T. 10 (Holtz). Lenche was successful in employing unilateral cervical sympathectomy in those cases to which hormone therapy of tetany failed. Russian authors have reported favorable results from the implantation of ox bone in the soft tissue (Oppel's method).

The treatment of choice in genuine hyperparathyroid condition is surgery especially for cases of osteitis fibrosa generalisata accompanied by parathyroid tumors. Erdheim believed that there was a genuine hypertrophy of the parathyroid due to a disturbed mineral metabolism. Although this belief was suggested it is not completely accepted. Clinical facts differentiate between experimental osteitis and the generalized fibrous osteitis found in the human as well as the finding of non toxic

adenomas without bony changes make it probable that not only increased function but also pathological function of the parathyroid was present in cases of generalized osteitis fibrosa. Thus there exists a parallel to Basedow's disease a second parallel can be found in the importance of the metabolism for generalized osteitis fibrosa. A third similarity of the latter and Basedow's disease presents us with a clue to the understanding of generalized fibrous osteitis.

Similarly as in hyperthyroidism there exists a circular chain of events between the periphery (the bone) and the central regulative organ (the parathyroid gland). The central regulative organ works harder in patients with an increased demand of the periphery as in vitamin deficiency and disturbances of the metabolism. Normally the increased output is diminished because of the function of the superior glands (the hypophysis) and the central nervous system. However in cases in which the blockade is lacking there will be increased mobilization of calcium in the periphery and therefore increased parathyroid function. Thus the circular chain of events becomes clear. In the presence of embryonic elements in the parathyroid adenoma develop and a normalization of the calcium metabolism becomes impossible. According to Braine and Rivoire who reported 130 operations on parathyroid patients because of generalized fibrous osteitis the results were excellent when there was a single adenoma poorer when multiple adenoma occurred and most uncertain when the normal parathyroid gland was removed. Recurrences according to Snapper are caused by the reappearance of new adenomas. The most common cause of failure was failure to find the tumor because of its hidden location. A disturbance in the superior glands (the hypophysis) may be the cause of the growth of multiple adenomas. Should the surgeon overlook one this then may be the explanation for failure. Further causes for failure lie in the missed diagnosis of generalized fibrous osteitis a condition which can be interpreted by roentgenological clinical and especially biological findings. The most common cause of mortality following parathyroid removal is tetany which is due either to the absolute lack of parathyroid tissue or to recalcification.

In 75 per cent of the cases of generalized osteitis fibrosa stone formation is found in the urinary tract. The stone formation is caused by the disturbed mineral metabolism and not by the direct effect of the hormones. Hormone poisoning may lead to uremia. Kidney stones may disappear after the removal of the adenoma. In cases of stone formation with slightly elevated blood calcium but no bone changes and no parathyroid tumors the removal of the parathyroid glands should result in healing. However the author has had insufficient experience with this. In cases of chronic rheumatism with slight inflammation the removal of the parathyroid may be indicated. The best results are reported in Bechterew disease. The literature reports improvement in 57 per cent of a series of 131 cases. Removal



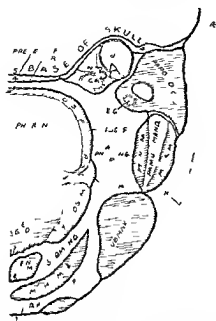


Fig. 3. Diagrammatic drawing of fasciae of the head and neck. Oblique anteroposterior section showing the relation of the submandibular space to the lateral pharyngeal space and Spaces 3 and 4. (Courtesy of J. B. Lippincott Co.)

#### KEY TO ABBREVIATIONS ON ILLUSTRATIONS

ALAR F—Alar fascia AL S—Axillary space  
 ARYT—Arytenoid cartilage AOR—Ascending aorta  
 AZ V—Azygos vein BR PL—Brachial plexus CLAV—  
 Clavicle COROC—Coracoid process CRIC—Cricoid  
 cartilage C C A—Common carotid artery CONST  
 PHAR SUP M—Superior pharyngeal constrictor muscle  
 D AOR—Descending aorta D D PECT F—  
 Deep layer of deep pectoral fascia

ected from Space 3 the parotid space, the mastica-  
 tor space or the submandibular space. Inverse  
 primary infection within the lateral pharyngeal  
 space may spread secondarily into those spaces.  
 Infection in the lateral pharyngeal space extending  
 into the submandibular space may resemble Lud-  
 wig's angina in the later stages. Chronic retro-  
 pharyngeal abscess is practically always due to  
 tuberculous caries of the cervical vertebrae. It is  
 usually confined to Space 5 behind the prevertebral  
 fascia and usually gravitates to lower levels along  
 muscles taking origin from the vertebral column  
 (psoas abscess). It may however remain localized  
 in the cervical region in which case it may rupture  
 through the alar fascia and enter danger space 4.  
 It is more common in adults. The clinical picture of  
 pain, difficulty in swallowing and speaking, chills  
 and fever, internal bulging of the pharyngeal wall  
 and external swelling of the neck should make early  
 diagnosis possible.

The treatment is chiefly surgical—early and ade-  
 quate drainage. This may be internal through the  
 mouth for cases confined to the posterior pharyngeal  
 region (visceral space and Space 3). External  
 incision is necessary for collections in the lateral  
 pharyngeal space or inferior extensions in Spaces 3  
 or 4. The T incision of Mosher with reflection  
 of the submaxillary salivary gland is especially  
 applicable for collections in the lateral pharyngeal  
 space. Spaces 3 and 4, including collections in the  
 superior mediastinum and posterior mediastinum  
 above the fourth thoracic vertebra, may be effec-  
 tively drained by a cervical incision anterior to the  
 sternocleidomastoid muscle (collar mediastinotomy).  
 The presence of such collections in the posterior  
 mediastinum below the level of the fourth thoracic  
 vertebra demand posterior thoracic drainage (dorsal  
 mediastinotomy).

MANUEL E. LICHTENSTEIN, M.D.

# THE TREATMENT OF FACIAL PARALYSIS

Collective Review from 1932 to 1938

DAVID CLEVELAND M.D., F.A.C.S., Milwaukee, Wisconsin

**A** REVIEW of the literature from 1932 to 1938 has revealed that in these years there has been a steady increase in the trend toward early surgical treatment in facial paralysis of the peripheral type. When the paralysis is due to tumors or lesions in the posterior fossa, the attack on the lesion is, of course, dependent upon the type of lesion present. This review is limited to treatment of facial nerve lesions within the facial canal or after the nerve has exited from the stylomastoid foramen. The treatment is then dependent upon the factor producing the paralysis. Such treatment is classified as non surgical or surgical. The non surgical treatment has consisted of physical therapeutic measures, including facial splinting, massage, electrotherapy, and diathermy. There are a few reports of some improvement following x ray treatment over the course of the facial nerve.

The surgical treatment may be subdivided into decompression operations, nerve suture, nerve grafts, nerve anastomoses, plastic operations, and cervical sympathectomies.

In regard to the physiological anatomy of facial nerve paralysis, Cardwell (14, 15) emphasized the importance of localizing the lesion according to the symptoms. A careful examination should be made in all cases of facial paralysis to determine the exact point of the lesion. Lesions below the stylomastoid foramen produce a complete facial paralysis without tinnitus or paracusis. In these cases, hearing is normal and there is no sensory disturbance of the tongue or palate. Lesions in the lower facial canal result in loss of taste over the anterior two thirds of the tongue and also cause a diminished salivary secretion. Lesions higher in the fallopian canal, but below the geniculate ganglion, result in facial paralysis and loss of taste in the anterior two thirds of the tongue and hyperacusis. A lesion in the ganglion causes complete facial paralysis, loss of taste, diminished salivary secretion, hyperacusis, paralysis of the palate, pain, and herpes. The lacrimal secretion is also diminished and may be the cause of serious eye complications. When the lesion is above the geniculate ganglion, there is paralysis of the face, diminished salivary secretion, hyperacusis, and

normal taste. Still higher, there is loss of hearing and labyrinthian reactions from the involvement of the eighth nerve. When the lesion is within the posterior cranial fossa, these symptoms are accompanied by signs from other cranial nerves.

Ballance and Duel (6) created interest in direct repair of the nerve within the facial canal, by either a nerve graft or nerve suture, when they reported remarkable recovery from facial paralysis after insertion of a nerve graft within the facial canal in animals and in patients. They performed a series of operations on baboons, consisting of nerve anastomosis between the facial and the adjoining neighboring cranial nerves, direct nerve sutures, and nerve grafts between divided ends of the facial nerve. In the grafts, they used various nerves for the interposing segment and concluded that similar results were obtained from all nerves—that it made no difference whether a motor, sensory, or mixed nerve was used.

Both Ballance and Duel, in their joint and separate reports (4-6, 23-28), admitted that anastomosis operations might result in good motor function of the muscles innervated by the facial nerve, but that return of power to these muscles was greatly handicapped by the always resulting associated movements. Ballance (4) stated that it is unnatural to unite one nerve to another when it is possible to unite the divided ends of a nerve with a nerve graft. In their earlier reports, Ballance and Duel favored the use of the external respiratory nerve of Bell for a nerve graft. Duel (26, 28) later abandoned the use of Bell's nerve and chose instead a femoral cutaneous nerve, the loss of which resulted in only a slight sensory loss. He believed that a nerve which had been allowed to degenerate for two or three weeks allowed for more rapid and complete recovery than a fresh graft. The reason given for this was that in the prepared graft the axons were degenerated, which left the tubes or spaces through which the down-growing axons from the central end of the facial nerve could easily grow. In the fresh graft, the products of degeneration might interfere with the growth of the new axons through the graft. The technique advocated by Ballance and Duel was to perform a mastoidectomy and remove the

outer wall of the fallopian canal to expose the facial nerve within its bony route. After this exposure of the nerve the destroyed segment could be removed and the ends freshened. A segment of nerve or nerve graft was then placed in the canal in close apposition to the divided ends. They stated that suturing was unnecessary. Great care was used to see that no blood gathered between the ends of the graft and the facial nerve. They believed at first that a dry wound was necessary for successful union between the nerves but they later modified this opinion and concluded that a small amount of blood around the nerve junction tended to seal the union in place. Great care was used however to see that no blood gathered between the ends. After the nerve graft was inserted it was covered with dental gold foil and the wound was packed without sutures. The wound was dressed daily without disturbance of the gold foil. Warm saline irrigations would remove any debris and healthy granulation tissue soon covered the entire graft. After about two weeks the gold foil could be removed with safety. At this time the graft was completely buried in healthy granulation tissue. In regard to the presence of infection within the wound they believed that the presence of infection did not prevent successful union of a graft. They would instill such a graft even in the presence of pus. Bunnell (11) was vigorously opposed to this statement and stated that in his opinion infection was an absolute contraindication to nerve repair either by graft or by end-to-end suture. He advocated waiting until all infection was absent before an actual repair be performed. Duel (27) reiterated the statement made by both him and Balfance that although anastomosis of the facial nerve with other cranial nerves may allow return of function of the involved muscles emotional movements do not return and that the voluntary movements are usually accompanied by associated movements. The experimental evidence that they had accumulated demonstrated that the use of autoplasmic grafts of any length whether reversed or unreversed would restore function of the injured facial nerve and that moreover this method of repair eliminated the associated movements which resulted from nerve anastomosis. At the same time emotional facial expression was regained. Facial nerve lesions in 35 patients were found to average 20 mm in length. When a short graft was required Bell's anterior respiratory nerve was used. When the lesion required a graft longer than 15 mm the use of Bell's anterior respiratory nerve was out of the question. The anterior femoral cutaneous nerve was then used

since the experimental work had demonstrated that sensory nerves were as efficient as motor nerves. Duel again reported that the presence of suppuration was not a contraindication to the employment of nerve grafts and that the field surrounding the nerve graft need not be free of bleeding. Heteroplastic grafts could be used with entirely satisfactory results in patients with the same blood grouping.

In regard to the non traumatic refrigeration or toxic type of paralysis known as Bell's palsy the majority of patients or roughly 80 per cent showed a complete recovery within six to eight weeks. In those cases in which recovery was so incomplete as to leave a disfigured face Duel recommended decompression of the nerve and splitting of the perineural sheath. He found that the experimental animal regained complete facial function more rapidly and more completely if the nerve sheath were split after the nerve had been subjected to such insult as freezing it with ethyl chloride. He also found that every case of long standing facial weakness following Bell's palsy would show improvement after the sheath of the nerve had been split. He advocated this procedure in all patients who did not recover within several months. In 1936 in a discussion of his previous work Duel (27) emphasized the importance of experience on the cadaver before any surgery on the facial nerve is done. At this time he stated that while the end results of direct facial nerve repair were more satisfactory than those obtained by any other method they were never perfect. There always remained some disassociation of movement because the new forming axons often divided to innervate more than one muscle. In this way the cell of origin which originally would evoke muscular response from one muscle would produce reactions in all the muscles to which the divided axon had grown. Because of this he stated that muscle re-education was an important adjunct in the treatment.

According to Sullivan (67-68) the labyrinthian segment of the facial nerve is not accessible to injury during mastoid surgery but the pyramidal segment including the tympanic and mastoid segments may be injured if great care is not used in the radical operation. When a facial paralysis follows as the result of a mastoidectomy the nerve should be exposed immediately. He states

It is much better to explore and determine immediately the nature and extent of the injury than to be harassed by uncertainty. Decompression can easily be performed if the nerve is swollen. If however the nerve is torn or partially destroyed a nerve graft as recommended by Bell

lance and Duel, should be performed. Prepared, degenerated grafts of two or three weeks' duration, taken from the anterior femoral cutaneous nerve, are used for the implants. He cites 2 cases to illustrate the complete recovery that can be obtained through this method.

In a paper praising the work of Ballance and Duel, Graham (33) reported 1 case of facial paralysis following surgery on the external ear and antrum, in which reoperation was done eight months later. The entire canal was opened and the facial nerve was found to be macerated within the canal. The ends of the nerve were teased together after the nerve was freed. The patient had a remarkable degree of recovery within eight months. A second case was described in which perfect recovery followed decompression of a nerve that had been paralyzed for two years. The author believes the time of operation is unimportant but that a careful, physiological study to determine the exact site of the lesion is important. In discussion of this paper, Bunnell (11) advocated waiting until a clean wound is present before any reparative surgery is performed. He also advises against the use of strands of silk or catgut to bridge nerve gaps. Recovery is dependent upon careful approximation of the nerve ends and the use of nerve grafts when necessary. When nerve grafts fail, the use of temporal muscle and masseter muscle nerve transplants is the method of choice.

Foster (10), in paying tribute to Ballance and Duel, described 2 cases of facial paralysis following mastoidectomy. In one, complete recovery followed decompression of the nerve with incision of the nerve sheath. In the other case, two strands of the internal, cutaneous nerve from the forearm were bridged between the nerve ends with resulting return of motion to the face. The frontalis muscle, however, remained paralyzed.

According to Tickle (71), the recovery in operations for facial palsy is dependent not only upon the technique but also upon the after-care and treatment. The canal of the external ear should be thoroughly cleansed and sterilized. This is done by filling the external auditory canal with 3 per cent iodine and leaving it in place for four minutes. The iodine is then sucked out by means of a medicine dropper, following which, two installations of 95 per cent alcohol are made. The canal is then washed out with sterile salt solution. Accidental paralysis should be explored at once and the nerve identified by faradic stimulation. The nerve is exposed in the canal from the stylo-mastoid foramen past the point of injury. In Bell's palsy, the nerve sheath is split and the

wound covered immediately with gold foil. When the wound is left open, as in accidental cases, and when grafts are used, the nerve is covered with sterile dental gold foil. The wound is left open, lightly packed with sterile gauze which has been soaked in sterile, saline solution, and is covered with perforated rubber tissue to prevent adherence of the dressings to the flap. In regard to the placing of the nerve graft, care must be used to prevent blood from accumulating between the ends. However, bleeding around the ends tends to seal it in place. In the after-care the dressings are changed daily and suppuration is removed by saline irrigation. Galvanic stimulation of the facial muscles once or twice a week helps maintain muscle tone. Tickle believes that operation is contraindicated in those cases in which muscles do not react to galvanism.

Smith (65) advised decompression of the facial nerve within the fallopian canal when facial paralysis follows mastoidectomy. He performed a decompression two years after a radical mastoidectomy had been performed, and the patient regained 70 per cent of the facial nerve function. A second case obtained complete recovery following decompression after a simple mastoidectomy. According to Morris (48), the facial nerve should be decompressed in Bell's palsy if no recovery occurs in from six to eight months. Morris cites 12 cases illustrating his viewpoint.

Craig (17) recommends conservative treatment in Bell's palsy for at least six months. During the period of paralysis, the eye should be protected and the muscles of the face splinted to prevent overstretching. He believes that a good index as to the advisability of surgery can be determined by electrodiagnosis. In cases requiring surgery particularly the accidental type, it is advisable to suture the nerve if possible. If this is not possible, hypoglossal facial or spino-facial anastomosis combined with a cervical sympathectomy is probably the treatment of choice. A cervical sympathectomy provides some degree of protection to the eye in that the fissure is narrowed and enophthalmos develops.

Ellis (29) advises decompression of the facial nerve in Bell's palsy if no recovery takes place in eighteen months. When facial paralysis follows operation on the mastoid, an autoplasmic graft as recommended by Ballance and Duel, should be instilled if no recovery takes place within a reasonable time. The graft must be inserted before muscular reaction to galvanism is lost. Duel repeatedly emphasized the value of decompression in about 20 per cent of the cases of the toxic or refrigeration type of Bell's palsy. He states that

if this 20 per cent were properly treated by decompression at the opportune time the incidence of permanent facial weakness would be greatly lessened.

Hutchison (43) reports a case of facial paralysis following mastoidectomy. A second operation was then performed and the facial canal was opened. The nerve was found to be damaged and partially torn. The nerve was realigned and sutured with fine catgut sutures through the perineurium. The patient was then given electrotherapy, massage, elastic support for the face and exercises to be performed in front of a mirror. The final outcome was one of almost complete recovery.

Sander (60) describes 2 cases of facial paralysis. A Frigore which were cured by decompression and states: Inflammation of the middle ear, acute or chronic, may be accompanied by congestion and possibly by infection of certain groups of mastoid cells around the fallopian aqueduct associated with periositis or osteitis of the latter, thus producing perineuritis and neuritis of Bell's nerve. Alternately there may be oedema of the neurilemma with compression of the nerve in the narrow and unyielding fallopian canal. Severe infection is not necessary for the production of these lesions; catarrhal otitis of a very mild degree may cause them. Atypical, abortive or latent forms of otitis forms which may not be discovered by clinical examinations may well be the cause of facial palsy. He believes that a decompression should be performed early if recovery does not begin a few days after the onset of the paralysis.

Tumarkin (74-76) questioned 150 patients who had had Bell's palsy and found that 1 of 5 showed incomplete recovery, varying from weakness of a single muscle to complete unilateral facial paralysis. In analysis of the initial symptoms and degree of recovery he noted that if pain and loss of taste were present the chances were two to one against complete recovery, but if neither of these were present the chances were twenty five to one that recovery would be complete. Consequently he considered these findings a valuable sign in determining whether or not decompression should be performed early. Because the facial nerve is accompanied in the canal by an artery and vein, Tumarkin believes that swelling of the nerve obliterates the vein by compression with the resulting venous stasis. Obliteration of the stylomastoid artery results in a vascular decompression which enables the vein to function. To counteract the vicious venous stasis in the canal Tumarkin performs a simple mas-

toidectomy and removes the perifacial cells and the posterior meatal wall to ablate the stylomastoid artery as it emerges from the canal. He also removes the outer attic wall to diminish tympanic congestion. He states this operation is simple and safe and is advisable when the criteria against recovery, namely, pain and the loss of taste are present. He cites 1 case of facial paralysis with herpes oculus with marked recovery within an hour after the operation. In regard to those cases of incomplete recovery from Bell's palsy with profuse tearing he states (73) that treatment is difficult at best and that excision of the lacrimal gland may be warranted. The accessory lacrimal glands will prevent xerosis.

Tempea (69) advised that all cases of facial paralysis. A Frigore should be examined by an otologist and if evidence of infection is present, surgery should be performed. He believes that recovery will be greatly aided by this procedure and cites 5 cases illustrating his viewpoint.

Verbruggen (77) recommends conservative treatment for two or three months in Bell's palsy and then if no recovery is taking place he advises decompression of the facial nerve. Massage and electrical stimulation are given as soon as the acute stage is passed to maintain muscle tone. He believes the nerve should be decompressed as soon as a facial paralysis is discovered in mastoid disease. When due to operative trauma in the temporal bone the nerve should be decompressed immediately even though an autoplasmic transplant may be necessary at a later date. When facial paralysis follows a skull fracture, no surgery should be performed during the first six months, in which time nearly all cases show complete recovery. In those cases with permanent paralysis following skull fractures, spinofacial or hypoglossal facial anastomoses are advisable. When the nerve is destroyed outside of the skull an autoplasmic graft should be used.

Bunnell (11) draws attention to the phylogenetic function of the facial nerve and illustrates how important the function of taste, the secretory function for salivation and tears and deep visceral sensibility are in the lower animals whereas emotional facial expression is very minor. In man facial expression is of extreme importance. He emphasizes the need for a careful determination of all the functions of the facial nerve in making a localizing diagnosis for a lesion. In a facial nerve injury complicating a mastoid operation the lesion may be located anywhere between the geniculum and the chorda tympani but is usually in the vertical portion just below the bend where the nerve often bows outward and may be sur-



rounded by mastoid cells. Therefore, when one curettes and searches too low for the attic or when one curettes away the bridge, the nerve may be torn apart, or a segment of it may be lost. In Bell's palsy, swelling of the nerve produces an ischemia, with a resulting necrosis over the length of the nerve. The nerve compression or necrosis is usually in the most distal part of the canal. Decompression of the nerve would be a cure in all cases if done immediately and properly. Eighty per cent of the patients, however, recover spontaneously and, if all patients were operated upon, 80 per cent of the operations would be unnecessary. Bunnell believes that if recovery does not take place within six months, surgical repair is indicated. Decompression may result in improvement even though performed long after the lesion has occurred.

Parkes (32) recommends decompression of the facial nerve within the canal when facial palsy complicates suppurative otitis media. In the acute and simple cases, simple mastoidectomy only is indicated. When facial palsy follows the mastoidectomy, the nerve should be exposed immediately and treated in accordance with the pathology found. When the nerve is swollen, splitting of the sheath will usually suffice. When there is a loss of nerve substance, an autoplasmic graft should be performed. The prognosis is somewhat dependent on the duration of the palsy, and the earlier it can be treated the better will be the results.

Bunnell (11) states that intratemporal repair of the facial nerve is the method of choice in destructive lesions of the facial nerve. Anastomosis of the peripheral end of the facial nerve with neighboring cranial nerves is obsolete in that associate movements occur and emotional facial expression never returns. The first successful suture of the facial nerve intratemporally was reported by Bunnell in 1927. His second case, treated by operation in 1928, three years after the original lesion occurred, was followed by a sloughing of tissue and an unsuccessful operation. In 1930, he bridged a  $2\frac{1}{2}$  in gap in the facial nerve by a three branched graft from the sural nerve. Facial symmetry was established in eight months, and voluntary motion was present in the entire face, with the exception of the frontalis and platysma muscles, within seventeen months. This, according to Bunnell, was the first successful facial nerve graft performed. He reports a fourth case with marked recovery following re routing and suturing of the facial nerve ends. The operation which Bunnell recommends for repair of a facial nerve gap is re routing of the nerve and an

end to end suture. By re routing a distance of 23 mm can be gained. The operation is performed by extending a mastoid incision well down the neck, paralleling the flexion crease. The facial nerve is located as it exits from the stylomastoid foramen. Here it is 1 in deep and directly under the lobule of the ear. After the nerve is encountered exiting from the stylomastoid foramen, it is uncovered from below, upward, by careful chiseling away of the mastoid process. The nerve lies  $\frac{3}{8}$  in deep in the bone and therefore a channel wide enough to work in freely is uncovered. After the lesion has been found, the nerve is re routed from a bending route to a straight one. If the vaginal process and tympanic plate of the temporal bone are chiseled away, the nerve can be re routed directly from the parotid gland without anchoring at the stylomastoid foramen. In this way 1 cm can be gained. Freeing the nerve into the parotid gland, and displacing the parotid gland upward and anchoring it to the digastric muscle, will add 6 mm. If the lesion is in the geniculate ganglion, an additional 7 mm can be gained by re routing directly from the parotid gland to the geniculate ganglion. When the gap is too great to be overcome by re routing a free nerve graft is advisable. For this purpose, Bunnell uses a sural nerve. He believes that small nerves used for grafting purposes are more successful than large nerves because nourishment of a small graft is more easily maintained in the surrounding lymph than that of larger nerves. In regard to the technique of attaching the nerve ends, he strongly emphasizes the importance of careful suturing with the finest possible needle and silk. The success of the operation is proportional to the accuracy of the union. Infection, free blood, or granulation tissue will greatly detract from the accuracy of healing, and nerve sutures should not be attempted in the presence of free bleeding or infection.

When it is impossible to repair the facial nerve, a plastic operation should be done. This operation consists of swinging portions of the temporal and masseter muscles forward to the muscles of the face, where they are attached by multiple fascial grafts. A portion of the temporal muscle is swung forward and three fascial grafts are attached to the orbicularis oculi of the upper lid, and one to the lower. A second portion of the temporal muscle is then attached to the muscles about the upper lip and nose by four fascial transplants. A portion of the masseter muscle is attached to the muscles of the upper lip, and a second portion, to the muscles of the lower lip by fascial transplants. A diagram illustrating this method is shown in the article.

Eight cases are cited illustrating Bunnell's method of facial repair marked improvement resulting in all but 1. In the 1 case of failure tissue sloughing prevented return of function. In a discussion comparing the various methods of treatment of facial paralysis following mastoiditis Saeger (61) recommends the procedure advocated by Bunnell.

Davis and Cleveland (18) describe 5 cases showing marked improvement in appearance and muscular control following spinofacial and hypoglossal facial anastomosis. Constantini and Curtillet (16) performed a bilateral spinofacial anastomosis and a bilateral section of the superior cervical ganglion in a patient who had no recovery in six months from a bilateral facial paralysis following a skull fracture. The operation was performed in four stages and the final result was extremely gratifying in that the face lost its flat toneless paralyzed appearance and volitional movements returned in the face. Photographs showed the end results in this case.

Sewall (62) describes 2 cases of facial paralysis complicating mastoid disease which showed no recovery after decompression of the nerve. The first case was treated by operation one month after the onset of the paralysis which followed a «condary» mastoidectomy. This case showed no recovery within five months after the decompression. A second case showed no recovery three months after decompression of the facial nerve. In this case the facial paralysis came on nine hours after a simple mastoidectomy had been performed and a decompression and opening of the sheath was performed twelve days later.

According to Dintenfuss (21) the facial paralysis occurring early in the course of an acute otitis media is a relative indication for mastoidectomy. The operation is not indicated unless other symptoms demand it. Facial paralysis occurring late in otitis media is an indication for mastoidectomy. Terracol (70) believes that facial paralysis in association with otitis media is an indication for surgical intervention. Hilding (40) performed a radical labyrinthectomy and opened the dura and the posterior fossa medial to the sinus. Twenty-seven days later the patient developed a facial paralysis and when the wound was re-opened a sequestrum of bone involving the facial canal was found and removed. The patient made a complete recovery within nine days.

Hirsch (41) classified facial paralysis and otitis media according to the stage of development and the complicating factors. From this classification he draws the conclusions that (1) facial paralysis which develops early in the acute stage of otitis media is not an indication for mastoidectomy

but, instead for myringotomy (2) when facial paralysis develops in the third or fourth week of the acute purulent otitis media it may be an indication for mastoidectomy (3) facial paralysis in chronic purulent otitis media without cholesteatoma, may be an indication for mastoidectomy if other reasons exist (4) facial paralysis in chronic purulent otitis media with cholesteatoma is an indication for mastoidectomy and (5) facial paralysis originating in pre-existing chronic purulent otitis media with acute labyrinthitis, may be an indication for labyrinthectomy to prevent threatening meningitis.

Many cases of facial paralysis are so complicated by a sufficient loss of the facial nerve that repair of the nerve is impossible. When this is the case plastic operations to overcome the deformity should be performed. Halle (34-37) recommends direct nerve suture or nerve grafts as proposed by Hallance and Ducl, when possible. However when nerve repair is impossible he believes that muscle nerve implants from the temporal and masseter muscles should be made to correct the deformity. In his earlier reports (34) he recommended the Roenthal modification of Lexer operation. This operation consisted of detaching a portion of the masseter muscle from the mandible and swinging it forward to the angle of the mouth. Here it was split again into two portions part of it being sutured to the circumoral muscles of the upper lip and the rest to the muscle of the lower lip. A small eighth moon wedge of tissue was removed just lateral to the lip to overcome the skin stretching that had taken place. To correct the upper facial paralysis, including paralysis of the orbicularis oculi and frontalis muscles the anterior third of the temporal muscle was detached from the temporal bone and swung forward in three segments. The medial segment was attached to above the eyebrow to the frontalis muscle the middle segment to the upper portion of the orbicularis oculi and the anterior segment to the lower portion of the orbicularis oculi. To overcome the skin and subcutaneous stretching that had taken place during the paralysis a small wedge of tissue was removed from under and just lateral to the lower lid. In later reports (38) Halle modified this operation because he believed it to be somewhat unphysiological in that the temporal muscle pull was not in line with the origin of the muscles. His modification consisted of swinging muscle strips from the temporal muscle downward from the temporal plane and using the ends of insertion for transplantation in the frontalis and orbicularis muscles. In this manner there is a true lifting of these parts by the muscle

contractions and, according to Rosenthal, re-innervation of paralyzed muscles takes place through the nerve fiber of the transplanted paralyzed muscles.

In regard to the use of muscle implantation which Sheehan (63-64) calls the muscle nerve graft, he states 'Incidentally to the employment of pedicled strips from the temporal muscle to correct the functional disturbance (lagophthalmos) associated with unilateral facial paralysis, it has been ascertained that there comes to be, in time, a complete organization of the strands of the overlying muscle graft with those of the base upon which it is placed. This is accompanied by such penetration as assures to the paralyzed tissues permanent reanimation from the fifth nerve. The functional reactions, in the closing of the upper eyelid, is identical with that normally derived from the seventh nerve. With this history the muscle strip is seen to be, in fact, a muscle nerve graft. Restoration of function is, of course, the concern of major importance. There are only two possible ways of replacing the absent nerve current upon which function depends. One is to reanimate the facial nerve at its root. The other is to reanimate the local muscles, and these are at the farthest removed from the nerve root.'

In defense of the muscle transplant operation Pickerill (53) states that while the use of temporal and masseter muscle grafts never results in a perfectly controllable face in facial paralysis, it does result in considerable improvement. The end results are better than those obtained in other operations, the advantages being (1) the face is stabilized to a considerable extent, having tonic muscles on the paralyzed side to oppose those on the normal side (2) the patient regains the power of closing the eye on the paralyzed side which eliminates the danger of conjunctivitis and corneal ulceration, (3) there is marked improvement in the psychic and mental attitude of the patient and (4) the voluntary closing of the eye and contractions of the mouth after constant practice, became almost automatic.

Sheehan (64) feels that long standing facial paralysis may be accompanied by such extensive atrophy and fibrosis that reanimation of the seventh nerve may be futile. Muscle nerve grafts, however, bring about restoration of function through the muscle strip implants and, seemingly, through actual innervation of the paralyzed atrophied muscles. The lagophthalmos is corrected at once by muscle strips to the eyelids. Also, facial symmetry is improved immediately.

The technique of the operation is to turn a thin strip of temporal muscle, with its nerve and blood

supply intact, across to the orbicularis oculi of the upper lid and a smaller strip to the lower lid. The strips are sutured close to the edge of the lid and at the inner canthus. A muscle strip is then passed under the skin to the muscles at the angle of the mouth and sutured to these muscles. The zygoma is grooved to allow room for the muscle strip so as not to cause a bulging of the skin at this point. A third strip is then passed to the frontalis muscle for reanimation of this muscle. Illustrations of the operative procedure, and pre-operative and postoperative photographs of a patient, showing a very satisfactory result, are included in the article.

Rebattu and his associates (55) analyzed facial paralysis following injury to the skull, and concluded that facial paralysis immediately following an injury is probably due to the trauma. When it occurs several hours after the accident, it is probably due to hemorrhage, but when it is delayed for several days, it is usually due to a secondary infection. They describe a case in which facial paralysis occurred fifteen days after the patient received a basal skull fracture. A complete return of function resulted after a mastoidectomy was performed.

Hjeltnan (42) advocates the muscle plastic operation of Lexer and Rosenthal in irreparable facial nerve lesions, but he believes that a cervical sympathectomy to help correct the lagophthalmos, should be performed in combination with the muscle plastic procedure. Babbitt (3) was able to obtain marked improvement in 2 cases of facial paralysis of long duration by performing the muscle plastic operation. He believes that this operation is indicated in otherwise irreparable facial nerve lesions. Dorosbenko (22) describes 14 cases of from six months' to eight years duration, which were markedly improved after autoplasmic muscle transplants of the Kirchner type had been performed.

Brooke (10) states that treatment of facial paralysis is difficult and taxes the ingenuity of the surgeon. Nerve anastomoses are difficult, and the resulting associated movements tend to spoil the otherwise good results. Cervical sympathectomies, to enable closing of the eye, have no effect on the facial symmetry. He advises the use of fascia lata strips, similar to the operation described by Passot. This operation consists of threading a  $\frac{1}{8}$  in. strip of fascia on a probe and passing it from the temporal region in the subcutaneous tissues, to the tissues beneath the skin of the upper eyelid. It is then passed around the inner canthus of the eye under the skin of the lower lid and back to the temporal region, where

it is again anchored. A second fascial strip is passed from the temporal region to just lateral to the angle of the mouth. It is then anchored around the muscle and fascia at the angle of the mouth and brought back to the temporal region where the ends are tied around the zygomatic muscle. The drooping of the mouth is slightly overcorrected to allow for some fascial stretching.

Wardill (9) used 4 fascia lata strips to suspend the drooping face and mouth muscles and to narrow the widened fissure of the eye with very satisfactory results in a case with an irreparable nerve lesion.

Gillies (32) believes that in all cases of facial paralysis fascial support is advisable. He advises nerve grafting when there is response to galvanism. The operation described by Gillies has a purely palliative effect similar to a cockup splint in a radial nerve paralysis. The operation consists of removing long thin strips of fascia lata either by the open method or by means of a ring stripper and fascia cutter. In this second method a small incision is made above the knee to expose the fascia and then the ring stripper is applied to obtain a long narrow strip of fascia. The loops of fascia lata are then passed around the facial muscles at one or more of the following points: (a) the center of the lower lip, (b) the corner of the mouth, (c) the center of the upper lip, and (d) the palpebral fissure. The Blair type of fascia needle is used for passing the loops around the muscles. It is advisable to embrace the fibers of the non-paralyzed muscle of the upper and lower lips. In the first series of cases separate loops were passed to each point and then fixed to the fascia in front of the ear. This operation can be performed through short incisions.

A convenient method of supporting the lip is to pass a loop to the center of the upper lip and one to the center of the lower lip and to fix these loops at one point at the angle of the mouth. From this point another loop can be passed to the point of fixation. Gillies in one series passed the fixing loop around the zygoma but in a later series, he fixed the loop to the fascia over the temporal muscle in order to pull the mouth upward and backward to simulate a normal appearance. The fascia was fixed by means of silk or catgut sutures.

Activation of the face by attachment of the fascial loop to a flap of temporal muscle is considered advisable and possible but it is doubtful that one is able to gain emotional control of the facial muscles especially under any stress. There may be a disfiguring bulge because of the bulk of the temporal muscle flap in the zygoma. To counteract this Sheehan (64) advocated the for-

mation of a groove in the zygoma to accommodate the muscle bulk. The deep layer of the muscle bulk with its nerve supply intact is separated from the superficial layer of fascia. The deep layer which forms the sheath of the muscle is kept intact. The raw surface of the muscle is covered with fascia lata. In this way the muscle belly is encircled with a fascial sheath which is pulled down into the prepared prezygomatic groove and attached to the stay loop that encircles the paralyzed circumoral muscles. During the World War Gillies used spring cartilages to encircle the palpebral fissure but with rather meager results. He also used fascial loops passed from the forehead under each lid to the inner canthus. When they were attached to the frontalis muscle a definite lift to the lower lid was obtained for protection of the eye. However he obtained more satisfactory results with the use of the temporal muscles and fascia. A flap of muscle with a considerable amount of fascia was cut far forward and one strip passed to the upper lid and one to the lower lid, the two meeting at the inner canthus. The strips were fixed to the periosteum medial to the inner canthus. The purpose of this procedure is to produce a squeezing together of the eyelids by contraction of the temporal muscle. Careful pre-operative preparation of the tissues and painstaking aseptic precautions during the operation are necessary to prevent infection. Hematomas often occur and these may become infected. When serious exudation takes place removal of the silk knot usually clears this up.

Demef (19) recommends fascial strips from the upper and lower angles of the mouth to the zygoma in facial paralysis. Von Blaskovics (7) describes an operation to correct the lower lid droop in facial paralysis. This operation consists of the removal of a wedge of tissue from the lower lid and a narrow strip of tissue 1 cm. lateral to the eye extending downward for  $\frac{3}{2}$  cm. from the level of the eye.

Cadenat (12) advises transplantation of the digastric muscle to the corner of the mouth when the inferior branch of the facial nerve is paralyzed. This type of paralysis frequently occurs when benign tumors of the parotid are removed. Sohma and Imamura (66) recommend transplantation of the triangulans oris muscle to correct the mouth droop in facial paralysis. They state this is a simple procedure and results in an improved appearance.

Kennon (44) devised a splint to hold the mouth in normal position and to prevent overstretching in temporary facial paralysis. This splint con-

sists of a small temporary hook, covered with rubber tubing, to which is attached an elastic strap. The hook fits in the angle of the mouth, and the strap passes in front of the ear, over the head, and is attached to a wire bent around the opposite ear. Pinkus (54) designed a prosthetic hook, which is attached to a crown of a tooth. A small projection of this hook fits in the corner of the mouth and holds the mouth in normal position. The projection is barely visible in the mouth.

There are numerous reports of marked improvement in the appearance and protection of the eye in facial paralysis, following removal of the cervical sympathetic ganglion. This operation produces a Horner's syndrome with a resulting enophthalmos and narrowing of the fissure. The very disagreeable lagophthalmos of facial paralysis is often markedly improved by the sympathectomy. There seems to be little difference in the results between the removal of the superior or inferior sympathetic ganglia. Wakely (78), Wertheimer (80), Roasenda and Dogliotti (56), Roques (57), Caero (13), and Ostrowski (51) all report gratifying results from cervical sympathectomy.

The majority of patients with facial paralysis due to inflammation of the facial nerve will recover spontaneously without surgical intervention. It is a common belief that in these cases recovery is aided by physical therapy. Martin (46) recommends the use of external heat in some form and static wave-current electrotherapy in Bell's palsy. The static wave current is the main agency because of its mechanical action. One metal electrode is applied directly over the distribution of the facial nerve, and the opposing electrode in the same position on the opposite side. Moderate milliamperage (3 ma) is used for twenty minutes. The author states that the passing of the current between the electrodes causes a contraction and relaxation of the tissues which is synchronous with the current jump. In this manner, the inflammatory products are expressed from the tissues into the lymph channels and nerve pressure is relieved. From two to four treatments will usually result in recovery if they are begun early. If the treatment is begun later than thirty-six hours after the onset of the paralysis, additional treatments are necessary. If two or three weeks elapse before the treatments are started, galvanic current must be used instead of static wave current. The author makes a plea for early static wave treatment.

Arwine (2) recommends the use of mild, negative galvanic current early in the course of facial

paralysis, to be followed later by alternating, sinusoidal, interrupted current. He describes a case of facial paralysis following mastoidectomy, which showed marked recovery following this procedure.

According to Nicolle (50), the treatment of facial paralysis should be directed toward the cause. Mastoid infections should be operated upon, tumors should be removed or irradiated, and foci of infection and diseases should be adequately treated. In regard to electrical stimulation of the nerve, he believes that faradism is somewhat dangerous in that severe contractions may result. The author recommends the method originated and modified by Bourguignon, namely, that of using a small, negative electrode soaked in 10 per cent potassium iodide solution placed over the point of the lesion, and a large, positive electrode, soaked in physiological saline solution or plain water, placed over the neck or between the shoulders. A current of from 2 to 3 ma is introduced for thirty minutes daily for one week, and then three times a week until from 10 to 15 treatments have been given. The iodine is thought to penetrate the tissues and soften the scar tissue. This method is also recommended by Gauducheau (31).

Tucker (72) believes that in true Bell's palsy, the prompt institution of a blister and heat over the mastoid area aids in the reduction of inflammation of the facial nerve. He also advises the administration of salicylates and iodides, the use of adhesive splints to prevent facial sagging and, after the acute inflammation has passed, the skilled use of massage and electrotherapy.

According to Moldaver (47), the treatment of facial paralysis should be guided by careful determination of the muscle chronaxy. In those cases in which chronaxy determinations show a possibility for return of function, electrotherapy is indicated. The method advised is similar to that recommended by Nicolle. It must be remembered, however, that unless electrotherapy is properly used, more harm than good may result. Overstimulation of the muscles may produce postparalytic contractions.

Rutherford (59) recommends the use of diathermy to hasten recovery in facial paralysis, and states that the results in 75 cases which were followed were very satisfactory. His method is as follows:

The operator sits in a chair, on the seat of which has been fastened a circular, vulcanite plate  $\frac{1}{4}$  in thick and 12 by 14 in in diameter. This plate rests on a tin or sheet iron base, 10 in in diameter which is connected to a diathermy unit.

The patient sits in an ordinary chair facing the operator and a 5 by 2 in diathermy plate, smeared with diathermy soap is attached to his arm. The current is turned to 3 ma and the operator touches the patient's arm with his hand. If the paralysis is in the right side the operator uses his right hand and the left hand if the paralysis is in the left side. As the operator's fingers touch the patient's arm a sparking effect is produced. A feeling of heat is produced by the contact the amount of heat being less if all the fingers are touching, than if only one or two are being used. The current is then turned on full from 3 ma and after a few moments the operator brings his other hand in contact with the paralyzed side of the patient's face. When the patient has become used to the current the operator's fingers are gradually lifted from the patient's arm until all the current is passing through the patient's face. The muscles of the face are then massaged from the angle of the jaw forward with a creeping or walking motion. Treatment is carried on for from ten to fifteen minutes and finished by allowing some sparking to the face. Following the treatment the face remains flushed from twelve to twenty four hours. Treatments are given two or three times a week and improvement usually begins within the first week. The average period of treatment is from four to six weeks but may be longer if reaction to degeneration has set in. In addition to the diathermy massage the following chart of exercises are given to the patient to perform at home.

1 Pull down the upper eyelid with finger keep it closed for a second remove fingers and try to keep eyelid closed Repeat this from five to ten times

2 Hold sound side of mouth closed with fingers and thumb Try to repeat labial words (words starting with B P M V F) with affected side of the mouth

3 Hold the sound side of the mouth and try to grip finger or pencil with lips on affected side

4 Close lips Suck in and blow out cheeks (Each exercise is to be repeated from five to ten times two or three times daily)

Bourbon (8-9) states that physical therapy is a distinct adjunct to the treatment of facial paralysis of peripheral origin. When facial paralysis is due to pressure from exudation as the result of hemorrhage lymphatic engorgement focal infection or from neuritis due to cold or exposure the nerve may become fibrosed and hardened unless the exudate is absorbed. Heat is an effective aid in hastening the absorption of the exudate. Diathermy gives the deepest penetration of heat but

an infra red or radiant heat lamp may be satisfactory. Rest to the paralyzed muscles is important, and strapping and splinting of these is advised.

According to Royle (38), massage in facial paralysis should be over the mastoid area and the side of the neck from the occiput to the chin on the affected side. Massage of the muscles produces fibrosis. He believes that electrostimulation of the muscles of the face is useless. Instead he advises the patient to attempt facial exercises with the normal side of the face held immobile. Arce (1) advocates electrotherapy in true Bell's palsy. De Munter (20) advises the use of electrotherapy massage and diathermy in Bell's palsy as soon as possible.

Hansson (39) states that in Bell's palsy local and general rest should be instituted immediately. The eye should be protected and the facial muscles splinted to prevent overstretching. Electrodiagnosis is a valuable adjunct in determination of the prognosis. If there is a reaction to both galvanism and faradism recovery will take place in from six to eight weeks. When the reaction to faradism is questionable and the reaction to galvanism good recovery will occur in from two to three months. When the reaction to degeneration is complete no recovery will occur before three months and, possibly, not before one year after a sufficient period of local and general rest. Hansson recommends the use of heat preferably infra red to the paralyzed side for ten minutes to be followed by electrostimulation of the affected muscles with an interrupted galvanic current. A unipolar negative electrode is advised for stimulation of the affected muscles. This treatment is given every other day until full recovery has taken place. The patient is taught how to apply gentle massage to the affected muscles and exercise his face in front of a mirror.

New and Kirch (49) describe a clinical entity of a non-inflammatory, permanent enlargement of the lips and face sometimes associated with unilateral and bilateral facial paralysis. In some cases the facial paralysis antedated the facial swelling by many years and was probably due to swelling of the nerve. The treatment advised by the authors was to inject boiling water into the tissues and later excise the tissues.

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# SURGERY OF THE NERVOUS SYSTEM

## BRAIN AND ITS COVERINGS CRANIAL NERVES

Fischer E. The Angiographic Diagnosis of Compressive Intracranial Processes (Zur Aufklärung raumbeengender intrakranelle Prozesse im Gefäßsbild) 63 Tag d deutsch Ges f Chir Berlin 1939

From the large field of angiographic diagnosis three features are presented (1) the syndrome of cerebral artery displacement (2) the diagnosis of cerebral vascular occlusion and (3) the significance of pathological vessel and capillary outlines. On the basis of a precise analysis of the arterial picture (*Zentralbl f neurochir* 1938 3 300) it is possible to draw certain conclusions regarding the presence of processes specific in locality and type simply from the displacement of vessel. The alterations of vessel configuration contribute an important diagnostic point. The speaker has already reported on the tumors of the frontal lobe and basal ganglia (*Zentralbl f neurochir* 1939 4 72) and enters briefly into the characteristics of the temporal lobe. Six main groups of temporal lobe tumors may be distinguished in the vessel picture. Of these the more infrequent and extracerebral tumors give the best operative results: the frontotemporal and usual temporal lobe gliomas are on the border line of operability and the true basotemporal tumors are incurable (*Zentralbl f neurochir* 1939).

The strictly basomedial glioblastomas of the temporal lobe represent an especially interesting tumor group. In the vascular picture they can be definitely recognized before operation by the form of the middle cerebral artery at its origin and the form of the carotid bifurcation as well as by the structure of the basal vessels (Aa perforantes) in the lateral view which is usually significant. These tumors which give only few clinical symptoms in themselves show a remarkable tendency toward degeneration, hemorrhage and cyst formation in the deep central region and internal capsule area, hence at a distance from the primary focus. They lead easily to confusion with common apoplexy and an irrelevant anamnestic trauma is frequently advanced as their cause. The involvement of the basal arteries perforantes in the glioblastoma which likewise supply the internal capsule leads to disturbances of the blood supply in the region of the internal capsule with degeneration, hemorrhage and cyst formation.

Such intracranial hemorrhages may be easily and clearly distinguished from the extracerebral subepidural and epidural hematomas. The hematomas lead to the familiar direct displacement of the peripheral cerebral vessels from the calvarium in the anteroposterior view. The speaker was able to predict pre-operatively an arachnoiditis polycystica with expansion of the subarachnoid spaces and of

the interhemispheric fissure from the more irregular wavy displacement of the cerebral vessels from the cranium and the widening of the interhemispheric fissure (*Zentralbl f neurochir* 1938 3 300).

Furthermore three groups of patients exhibited ventriculograms with the following in common: a moderately prominent hydrocephalus, a tilting of the septal plane with slight lateral deviation of the ventricles, and peripherally widened fluid spaces. The angiograms provided an explanation in all the cases. In the first there was an obstruction of the anterior cerebral artery, in the second an obstruction of the middle cerebral artery and in the third both main vessels were occluded. The majority of the patients suffer from epileptic attacks, and in many cases injury or overexertion at work is held responsible. It is possible that a spastic component contributed primarily to the origin of the vascular affection but at the time of observation the changes were organic. This could also be demonstrated frequently in the arteriograms. Pictures of atherosclerosis of the basilar arteries, endangitis obliterans, and partial embolic occlusion of the cerebral vessels are given in the original article.

As far as change in the capillary and vascular structure shown in the angiograms are concerned, the characteristic pictures of meningiomas and glioblastomas are familiar; the latter conceived by the author together with Toennis as hemicro-aneurysmal structure and arteriovenous fistulas. Two years ago at the Neurological Congress in Munich (*Zentralbl f neurochir* 1938 3 50) it was pointed out by the speaker that among the richly vascularized gliomas the very vascular oligodendrogliomas achieve a sharp definition in the angiogram either as negative or positive capillary tumor shadows or through the change of the individual blood vessels supplying the growth which break up into a fine clearly visible vessel network. It is often difficult to distinguish these tumors from normal brain tissue. The pre-operative recognition of such tumors in the angiogram as opposed to that of the poorly vascularized and sharply limited oligodendrogliomas is therefore of great practical significance. Astrocytomas give an indication of pathological vessel outline only in very limited instances. And only seldom will it be possible as in a case of primary gastric carcinoma presented to diagnose intracerebral tumor metastases by means of the multiplicity of changes.

(E. FISCHER) O. THEODORE ROBERG, JR. M.D.

Jefferson G. and Jackson H. Tumors of the Lateral and of the Third Ventricles. *Proc Roy Soc Med Lond* 1939 32 1103.

This article deals only with those tumors which are unmistakably intraventricular, and these comprise five types: (1) the choroid plexus papillomas (2) the meningiomas of the tela choroidea (3) the



colloid cysts of the paraphysis (the best example of a true intraventricular tumor), (4) the epidermoids, and (5) a few gliomas which may arise from the ependyma or the extra ependymal neuroglia around the ventricles. Pineal tumors, pituitary anlage tumors, and gliomas of the basal ganglia impinging upon the ventricles are distinctive in their own right and are not to be considered as primarily intraventricular tumors. The five types of tumors named are illustrated by short well selected case histories. Intraventricular ependymomas it will be noted have been rare in the experience of these authors.

Jefferson and Jackson are anxious to evaluate the symptoms of disturbed autonomic physiology which may occur in patients with intraventricular tumors. With the pure type of intraventricular tumor there is no reason to expect marked or typically diagnostic hypothalamic signs. The disturbances of function usually found in cases of true intraventricular tumor are due to hydrocephalic dilatation of the third ventricle and to impairment of the blood supply to the centers in the walls and floor of this ventricle. Disturbances so produced do not differ essentially from those seen in patients with other causes for an existing hydrocephalus or third ventricle dilatation. Reasonable but not too much emphasis should be placed on the diagnostic value of the autonomic disturbances in a patient with a tumor of the ventricles such symptoms often are not specifically informative and may be misleading.

The final diagnosis of tumors of the ventricle is roentgenological ventriculography being the usual procedure. Even with this valuable aid one must exert caution in diagnosis because of the possibility of pseudoventricular tumors as for instance a partial cut off of the third ventricle by a glioma of the optic thalamus which may be erroneously diagnosed as an enucleable tumor free and promising within the ventricle.

JOHN MARTIN, M.D.

**Gavazzeni A. Results of Roentgen Therapy of Tumors of the Region of the Hypophysis (Risultati della roentgenterapia nei tumori della regione ipofisaria) Radiol med 1939 26 601**

Gavazzeni describes 14 cases of tumor of the region of the hypophysis which he has treated with roentgen rays and which he classifies schematically into two groups: tumors with a chiasmatic syndrome and more or less marked signs of hyperpituitarism (10 cases) and tumors with an adposogenital syndrome (4 cases). The results from one to seventeen years after treatment were in the first group: 4 lasting notable improvements, 2 lasting partial improvements, 2 temporary partial improvements and 2 slight and only temporary improvements, i.e. good results in 60 per cent and failures in 40 per cent; in the second group: 1 lasting improvement and no improvement in the 3 other cases. Globally the results were good or moderately good in half of the cases and unsatisfactory in the other half.

Beclure's method of treatment was used: irradiation of the sellar region through two temporal and

two (or one) frontal ports, the fields being restricted to 8 by 10 cm., exceptionally, nuchal and vertex ports were used. Rather high doses were given (600 to 800 roentgens per field) in a series every day or every two days, and the same series was repeated after two or three months to be then given at greater intervals according to the clinical course of the disease. The focal distance was 40 cm. Large total doses are needed even in case of presumably adenomatous forms. A total dose of from 25,000 to 27,000 roentgens through three ports was given in 131 sittings to a patient in whom the only resulting drawback was permanent loss of temporal hair and moderate atrophy of the skin with some telangiectases. The reported observations show that the treatment does not endanger the skin or the nervous system. However the appearance of epileptic attacks in 1 case led to suspension of the irradiations. Incidents reported by other authors did not occur in this series. In all cases the headache was rapidly relieved. Vision was not improved in 2 certain cases of tumor of Rathke's pouch it was variously improved in 10 cases, the general condition was better in all cases in which the result was good or moderately good.

From the analysis of statistics and the review of surgical publications it appears that the best results are obtained by surgical treatment; however it should be noted that the statistics are those of experienced brain surgeons who specialize in such operations and that the statistics of excellent general surgeons show less brilliant results and a high operative mortality. While the difference between the immediate results obtained by the two methods is considerable in that with surgery there is an immediate benefit and with roentgen therapy the benefit is slow to establish itself, the difference between the late results is not as great; in fact some roentgen statistics are equivalent to the surgical ones. Recurrences are very frequent after surgical intervention, especially and comprehensively by the transphenoidal route in which case nearly all surgeons recommend postoperative radium or roentgen irradiation to destroy possible remnants of the tumor. Roentgen treatment gives good results in a number of cases and is the treatment of choice in adenomatous forms in which it is at least as efficacious as surgery.

As the tumors of the region of the hypophysis vary in roentgen sensitivity it is necessary to determine as much as possible before the beginning of the treatment the seat and the nature of the tumor; the best results are obtained in acidophil adenoma of the anterior lobe with symptoms of hyperpituitarism but each case must be considered individually from the prognostic point of view. Immediate surgical intervention should be recommended in cases of rapidly progressive decrease of vision. Except in cystic forms and in those in which rapid blindness threatens, roentgen therapy should be tried in tumors of the region of the hypophysis and it is indicated postoperatively in solid tumors of the hypophysis to prevent recurrence. Higher doses

than 600 or 700 roentgens are indicated for tumors other than acidophil adenomas if the response to the first series of irradiations is favorable subsequent series are repeated at intervals of some months until a presumably final good result is obtained. Prolonged clinical control is necessary. If there is no response to the first or second series of irradiations the case belongs to surgery. **RICHARD KEMEL MD**

### SYMPATHETIC NERVES

**Paliard F and Etienne Martin P. The Surgical Treatment of Malignant Arterial Hypertension. Results and Indications (Le traitement chirurgical de l'hypertension artérielle maligne. Ses résultats—ses indications). Presse méd. Paris 1939 47: 893.**

Having followed the ever growing interest in the surgical treatment of hypertension since 1933 the authors have arrived at certain definite conclusions regarding the surgical treatment of choice.

They, as much as the rest of the world are at a loss to explain the actual and basic physiological alterations which cause essential hypertension. However they like the majority of the French investigators prefer to look upon this condition as a humoral imbalance and they point an accusing finger at the adrenal gland. They appreciate the implications of Goldblatt experiments upon dogs but they cannot accept his results as being applicable to a practical extent to hypertension in human subjects. They believe clinical experience especially in the cases of refractory hypertension when there is no kidney damage cannot and must not be set aside for the results of any animal experimentation.

From the wide range of operations used in Europe and the United States the choice by these authors lies among the following (a) unilateral or bilateral adrenalectomy (b) bilateral supradiaphragmatic planchnicectomy (c) left sided unilateral planchnicectomy (d) bilateral decapsulation and denervation of the kidney and (e) nephro-omentopexy.

They believe that hypertension arises from a peripheral rather than a central cause be it an abnormal sympathetic action or an endocrinal dysfunction and if it is on a humoral basis it is most likely to be due to adrenal influence or possibly the result of the action of vasoconstrictive substances which are products of a disordered metabolism. They like many others have found no tests to be used as criteria in judging a case to be suitable or not suitable for operation.

They have accomplished satisfactory relief of the subjective complaints of their patients, satisfactory lowering of the tension was accomplished in 8 of 12 cases the retinal disturbances remained essentially unchanged the function of the kidneys was not impaired by their operations and the condition of the heart in general was improved by the operations.

The state of the kidneys is an important factor in the decision as to whether or not surgery will accomplish the desired end. If the hypertensive patient shows no kidney damage planchnicectomy or adrenalectomy is indicated. However denervation decapsulation or nephro-omentopexy may be useful when the hypertension is malignant and the kidney function is obviously impaired. Cerebral accidents rapidly progressive vascular and renal signs and icterus are contraindications to surgery.

**JOHN MARTIN MD**

# SURGERY OF THE THORAX

## CHEST WALL AND BREAST

Maisin J H Estas P and Line D The Radiological Treatment of Cancer of the Breast and Its Metastases *Edinburgh M J* 1939 46 529

With a view toward ascertaining whether irradiation alone can offer as much as or more than surgery in the treatment of cancer of the breast the authors submitted a considerable number of patients with this disease to such treatment. The results are reported in this article. Both operable and inoperable cases are included in the series. The cases of all patients having a movable tumor in the breast ulcerated or not with movable glands in the corresponding axilla were classed as operable. A biopsy was done in each case.

As regards the methods of treatment at the beginning of their work the authors tested various methods of external irradiation alone in operable cases and they are still inclined to the belief that this will be the method of the future. However they found that external irradiation was not suitable for the majority of their cases and subsequently used external irradiation combined with interstitial radium therapy. Roentgen rays at 200 and 400 kv and radium applied by a 7 gm bomb were both used as sources of external irradiation. In some cases 3 large fields were exposed the supraclavicular region the axilla and the breast itself. In others, the entire chest including all of these areas was irradiated in one large field. The duration of the external irradiation was from one month to six weeks. Following this radium needles were inserted. Detailed information is given relative to dosage and technique.

The same method of irradiation was used in the treatment of inoperable cancer in patients with good general health in whom the lesion was limited to one half of the chest.

When widespread metastases in the skin were present only external irradiation was used. Single localized metastases to bone were treated simultaneously with the breast lesion. Widespread metastases were usually treated in one or two large fields. Metastases to the pleura yielded fairly good results but involvement of the lungs or of the liver responded very poorly, if at all. Since cancer of the breast is very probably the sequence of disturbance in the function of the ovary all patients who had not reached the menopause were sterilized. Medical treatment which aimed to produce remineralization or to improve the oxidation-reduction power of the organism was included as part of the treatment and considered to be a valuable aid. Dietetic regulations tending toward growth inhibition also formed an important feature in the conduct of these cases.

The results obtained are tabulated. In comparing the percentages of patients with operable cancer

who are living after five years with the best surgical statistics, it is apparent that the results are at least as good as those following the radical operation. In the inoperable cases, although the ultimate results were poor, irradiation not only improved the local condition and that of most of the metastases but lengthened the life of the individual.

ADOLPH HARTUNG M D

## HEART AND PERICARDIUM

Koster K H Pericardiectomy in Pericarditis Fibrosa 2 Cases (Perikardektomie bei Perikarditis fibrosa zwei Fälle) *Acta chirurg Scand* 1939 82 595

The chief emphasis in this report of 2 pericardiectomies is placed on the decrease of the venous pressure as determined by the method of Moritz and Tabora and the increase in the systolic output as determined by the method of Liljestrand and Zander an attempt being made to compare the Liljestrand Zander method with that of Grollmann

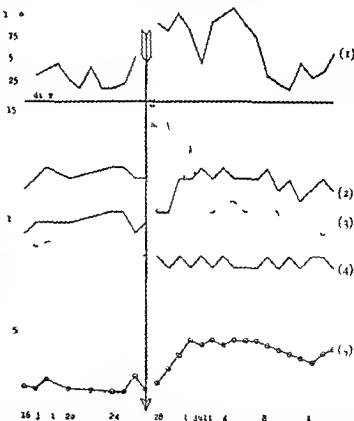


Fig 1 Patient 1 Before and after operation. The reduced amplitude since that time has been around 35 with great deviations and the pulse has been around 76. Curve (1) shows the urinary output. Curve (2) the systolic pressure. Curve (3) the diastolic pressure. Curve (4) the pulse and Curve (5) the reduced amplitude.

1000

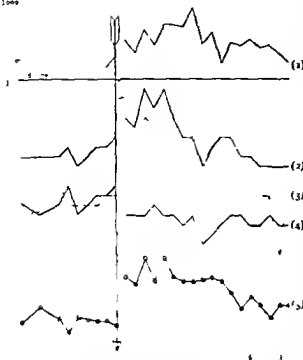


Fig. 1. Patient B before and after operation. The reduced amplitude since that time was 40 and the pulse 0 (excluding period during which a partial block existed).

Both patients exhibited the entire gamut of classic symptoms: heightened venous pressure with prominent vein cough, ascite, an enlarged liver with edema, a decreased systolic output with lowered blood pressure, pulsus parvus, cyanosis, oliguria, dyspnea on exertion, tachycardia and exhaustion. Both had a marked pulsus paradoxus but neither portrayed a tidal retraction of the apex area.

The patients were operated upon under conduction anesthesia with novocaine and adrenalin given by injection from the second to seventh rib and by local infiltration of the operative field. In both a flap was turned outward from the edge of the sternum including the cartilaginous portions of the third to the sixth ribs and in both the pectoralis muscle was dissected away from the flap before closure and drainage was established.

In the first patient in whom the cardiac symptoms had been of long duration the line of cleavage was easily followed and an area of 6 by 7 cm. of heart muscle beginning with the left ventricle was laid bare. In the second in whom the symptoms of cardiac involvement were acute of recent occurrence and of rapid course the fibro ed pericardium was everywhere densely adherent, no line of cleavage could be found and the dissection could not be carried clear down to the heart muscle. An area of 4 by 5 cm. however was removed as thoroughly as possible.

The subsequent increase in cardiac output and decrease in venous pressure together with improved diuresis are portrayed in graphs the first patient, Figure 1; the second patient, Figure 2. The second patient despite the relatively incomplete operation (1) has shown quicker and better improvement of his condition than the first one.

In these cases the Liljestrand Zander method seemed to yield results similar to those obtained by other investigators with Grollmann's method.

JOHN W. BRENNAN, M.D.

## ESOPHAGUS AND MEDIASTINUM

Hammar, J. A. New and Old Facts Known about the Thymus Gland (Neues und Altes ueber die Thymusdruese). *Lippincott's Medical Journal*, 1934, 44, 319.

After reviewing in great detail all the facts known as to the anatomy, histology, embryology, histogenesis, morphology and involution of the thymus, the author takes up the physiology of the gland and presents the following thesis on the function of the thymus:

The parenchyma of the thymus consists essentially of an epithelial reticulum permeated by lymphocytes which contain Vitamin B. This fact seems to constitute the basis for the experimentally proved property of the organ of favoring the growth of the body. In the thymus itself the presence of Vitamin B in the lymphocytes seems to explain the trophic effect of the cells upon the reticulum of the thymus. The number of the cells in the reticulum diminishes in proportion to the involutional rarefaction of the lymphocytes in the thymus, and when the latter have almost completely disappeared the remaining reticulum cells lose their reactivity and form the Hassall corpuscles and the thymus becomes involuted.

Vitamin C is demonstrable in the reticulum cells of the thymus. Their relatively abundant presence might determine the function of the thymus in the process of immunization in which focal cellular enlargements develop (Hassall corpuscles) in the reticulum just as secondary follicles develop in the reticulum of the lymphoid tissue as a result of cellular enlargement. However the Hassall corpuscles develop earlier than the secondary follicle and for the most part disappear almost entirely in the later stages of immunization. The significance of the conducting effectiveness of the thymus gland in immunization an effect which allows the Hassall corpuscles to disappear at a time when the titer of the antibodies is still very low is not as yet determinable. Nothing in the Hassall corpuscles indicate the processes responsible. The cellular degeneration regularly occurring in the larger Hassall corpuscles might lead to the assumption that the toxic substances are fixed there just as is the case in the spleen with diphtheria and tetanus toxins. Similarly in the results of the investigations in which thyroid was fed to chickens of all the organs examined only

the thymus was found free of active effective thyroid gland substances. It has also been found that the thymus, the lymphoid glands, and the spleen play the main part in the formation or deposition of antihodies.

At the time of puberty the gonads deliver sexual hormones to the blood which produce a decrease in the number of lymphocytes in the thymus, the lymphoid organs, and the blood. The gradual diminution in the number of the thymus lymphocytes determines the involution of the organ. Inasmuch as the sexual hormones replace the Vitamin C in immunization (and detoxication), they compensate for the puberal and postpuberal lessened significance of the thymus gland.

A diminution in the number of lymphocytes of the thymus and the lymphoid organs also takes place in nutritional disturbances and similarly developing accidental involution, and these disturbances usually run a more acute course than in the involution of advancing years. The factor responsible for this is not at present determinable but it is certainly not the sexual hormones. It is also unknown whether there is a compensation for the accidental retrogression of the thymus in this involution but this is possibly not the case. However it is well known that an organism weakened by hunger or similar influences has a diminished resistance to external injuries.

The author admits that the theory of the function of the thymus advanced by him does not constitute the final word on the subject but he believes that it presents a distinct advance in our knowledge of the function of the thymus. Already some objections to it have been raised. One concerns the inability of Vitamin C to increase the signs of immunization in thymectomized animals, to which the author replies that even though in his experimental animals the significance of Vitamin C in the immunization is practically reduced or replaced by the appearance of the sexual hormones at the time of puberty, the resulting behavior is certainly not unexplainable. It could be explained by suitable experiments on prepuberal animals. The other objection is concerned with the fact that there seems to be no place for the significance of the innervation of the thymus. Our knowledge of this innervation is at present certainly very incomplete. It has been shown that this innervation is of a double nature: in the upper part of the neck a branch from the vagus nerve supplies the thymus lobe of the corresponding side, delicate nerve branches also reach the thymus from the sympathetic nerve plexus of certain adjacent blood vessels. It is impossible to determine the behavior of these different nerves in the interior of the thymus especially during its involutions, as it has been shown that it is impossible to a marked degree to stain the nerves in the thymus with the usual nerve dyes. However we do know that in man the thymus is supplied in about the fourth fetal month with an abundant ramification of vagus fibers in the medulla and relatively few sympathetic fibers in the cortex

and that both kinds of fibers meet in a nerve plexus at the border of the medulla and cortex. An illuminating factor may be the fact that when the exposed stem of the vagus is stimulated by an electric current Vitamin B is released from the nerve stem itself. If it can be shown that a stimulation of the nerve has a similar influence upon the surroundings of the vagus branches, which at present is entirely unproved, the significance of the innervation of the thymus would no longer be entirely unexplainable. It is believed by the author that this innervation could well be incorporated as part of his theory.

LOUIS NEUWELT M.D.

## MISCELLANEOUS

Juzbašić D. M. Surgery of Rupture of the Diaphragm (Zur Chirurgie der Zwerchfellruptur). *Chirurg* 1939 11 47

The designation traumatic hernia of the diaphragm is not accepted by the Surgical University Clinic at Frankfurt a. M. because of the absence of a sac which absence is important also from the insurance standpoint because of the confirmation which it gives of its accidental origin. The condition is more accurately described as a transdiaphragmatic prolapse of the abdominal viscera. Such an occurrence is readily understood in the case of great force applied to the chest but it is found also following slighter traumas and even without trauma (B. Schultze, *Saving for Resuscitation of the Newborn*). If there is no prolapse of the viscera, tear of the diaphragm cannot be diagnosed and in the presence of prolapse it can be diagnosed only with the aid of the roentgen rays. The mortality is 70 per cent with strangulation 15 per cent without. Hence early operation is advised. Various procedures are used: (1) trans thoracic (irreducible prolapse), (2) abdominal (Mayo Clinic with over 100 cases), and (3) thoraco-abdominal and (4) division of the phrenic nerve. The last named procedure is not recommended, first because it is not without danger and, second, because even though the viscera slip back into place there is no assurance that the diaphragm will heal and that recurrence will not take place. Further it cannot be known whether the intestine is injured by strangulation. Schmieden uses sometimes the thoracic sometimes the abdominal operation. Disadvantages of the thoracic operation are the greater magnitude of the intervention and the fact that kinks may occur in the replaced intestine and bring about intestinal occlusion. After the transthoracic operation healing usually takes place by the round about way of an empyema. Advantages are a better view of the operative field, easier separation of the adhesions, easier closure of the tear in the diaphragm. The disadvantages of the abdominal route lie in the absence of the advantages just noted for the trans thoracic route. In order to get a better view of the diaphragm Schmieden makes an incision in the middle of the upper abdomen, which curves horizontally over the umbilicus, and raises the costal

arch with a specially constructed hook. The author then discusses diaphragmatic hernia and hiatus hernia. Since these are usually small most cases can be repaired successfully with the use of the abdominal route but recurrences are frequent with this route (Key). The case histories of 4 patients are published together with roentgen picture.

Case 1. In a traffic accident the patient sustained a fracture of the seventh and eighth ribs. Operation was not performed till forty days later when the diagnosis had been made by the aid of the roentgen rays. Under positive pressure anesthesia an incision was made between the eighth and ninth rib. The stomach, the large intestine (which showed a constriction ring) and the omentum were within the thoracic cavity. The rent in the diaphragm was closed with interrupted suture. Healing was preceded by empyema. At the end of two years there has been no recurrence.

Case 2. A four-and-one-half-year-old child had suffered from severe vomiting independent of the ingestion of food for some time. There was no history of trauma. The diagnosis was diaphragmatic hernia. Under basal anesthesia with avertin combined with ether anesthesia an incision was made in the seventh intercostal space. Loops of small intestine, the ascending colon with the cecum and appendix and part of the transverse intestine were found in the left pleural cavity. A sagittal slit 4 cm. long was found in the diaphragm. There was no hernial sac. Reposition was difficult although the adhesions were not dense. The diaphragm was closed. An air-tight closure of the thoracic cavity was effected with the exception of the space occupied by a drainage tube, the free end of which was introduced into a vessel containing water. For the first five days after operation symptoms of intestinal occlusion were present but these disappeared spontaneously. In this case also suppurative pleuritis developed.

Case 3. A thirteen-month-old child had vomited soon after birth. The condition was first diagnosed as pyloric spasm and not until the child was examined roentgenologically was the correct diagnosis made. Under ether anesthesia an incision was made in the sixth right intercostal space. The condition was a true diaphragmatic hernia on the right side as the hernial sac was present. The greater part of the

stomach was in the right pleural cavity. After subdiaphragmatic division of the phrenic nerve the hernial ring in the central tendon which was the size of the palm of the hand, was closed partly by a purse-string suture and partly by interrupted sutures. The wound was closed without drainage. Smooth healing ensued.

Case 4. The patient was a thirty-four-year-old man who ascribed his trouble to his having been dropped when he was an eighteen-month-old baby. At fifteen years he had vomited dark masses resembling coffee grounds and there had been blood in the stool. Thereafter he had been without symptoms for two years after which he had been treated for a stomach affection in various hospitals. Not until he was thirty-four years old was the roentgen diagnosis of epiphrenic diverticulum made. The patient was in a debilitated condition. Operation was done under positive pressure ether anesthesia. The right rib was resected. In the diaphragm which was very thin was a wide defect extending toward the paravertebral column. Through this there protruded a portion of the stomach the size of a man's fist. The surface of the stomach was bound by adhesions to the edges of the defect in the diaphragm. There was no hernial sac. The only way of closing the opening in the diaphragm was by suture of the dome to the posterior wall of the thorax. The wound was closed without drainage. Nineteen days after the operation it was necessary to open the wound because of the presence of suppurative pleuritis. Drainage was instituted. On discharge the patient was completely free of symptoms but the roentgen picture showed the tied-off portion of the stomach again outside of the abdominal cavity. Nevertheless it was two years before the patient had a recurrence of symptoms. Operation was done under avertin basal anesthesia combined with ether anesthesia but this time by the abdominal route and the stomach was successfully brought down. It showed a distinct constriction ring. An esophageal hiatus the size of a five-mark piece was found. The uppermost part of the fundus was adherent to the diaphragm. Sutures were placed around the dilated hiatus, the fundus being made fast for the space of three-fourths of its circumference and a portion of the posterior surface left free. Healing was smooth. (FRANK FLORENCE A. CARPENTER.)

# SURGERY OF THE ABDOMEN

## ABDOMINAL WALL AND PERITONEUM

Haglund O Pneumococcus Peritonitis in Children (*Ueber die Pneumokokkenperitonitis bei Kindern*) *Letskirurg Scand* 1939 82 549

The so called genuine or cryptogenic pneumococcus peritonitis under which term is understood a peritonitis in which the pneumococcus is encountered exclusively as the pathogenic bacterium in the peritoneal fluids is made the subject of this study. The author collects 77 reports from the records of various hospitals of southern Sweden and evaluates them in the light of the statements of various other authors on this subject. The material comprises that of the years from 1919 to 1934 inclusive and is rather narrowly selective in that about 100 cases were regarded as uncertain as to diagnosis and were excluded except for inclusion in the total incidence and in other tables for more inclusive results.

The relationship of the incidence of pneumococcus peritonitis to that of acute appendicitis the condition which is the hardest and the most important to distinguish is closely scrutinized especially in girls below the age of two years in whom pneumococcus peritonitis is by far the most prevalent. In the whole material the incidence of pneumococcus peritonitis as compared with acute appendicitis is 10 girls from one to five years of age was as 1:2.5 and from five to ten years 1:11 and finally from ten to sixteen years 1:269. As compared with appendicitis peritonitis the corresponding figures are from five to ten years 1:3.5 and from ten to sixteen years 1:36. Therefore pneumococcus peritonitis must always be considered in a young girl with the picture of an acute peritonitis. Of the 77 patients of the author 77 were females i.e. 92 per cent of the total number of cases. In giving the total incidence according to the year of life the author does not give figures but refers the reader to a graph which shows the rather uniform rise to the acme at eight years and then a rapid fall which indicates the rather rare incidence after the tenth year.

No relationship to the incidence of infections in other places in the body especially pneumococcal infections except a suggestive increase in the number of cases of pneumococcus peritonitis in Helsingborg (5 of the 13 cases during 1928) and Karlskrona (5 of the 12 cases during 1927 and 4 during 1928) during years when there was a noticeable increase in croupous pneumonia cases could be deduced from the author's material. In 7 cases in which under symptoms of pneumococcus peritonitis the abdomen was opened the only findings at this early period were a reddened intestine and swollen glands (cotenitis) the patients later all developed pneumococcus peritonitis.

Of course the overwhelming predominance of pneumococcus peritonitis in young girls tends to

subordinate every other portal of entry to that of the female genitalia in importance. However the author is unable from his own material to offer any help in deciding the disputed question of the female genitalia as a portal of entry in these cases.

In evaluating his material for characteristic symptoms the author finds that herpes is rare (only 1 case) symptoms from the respiratory organs were slightly more common (15 cases), and early symptoms suggesting involvement of the digestive tract are uncharacteristic. The symptoms which most nearly seem to characterize pneumococcus peritonitis are the frequent (in 62 per cent) and troublesome diarrhea the rapid development of a high temperature and the early and marked had general condition of the patient. Of course if abdominal puncture or laparotomy he resorted to the pneumococcus will be found either in pure culture or associated with other organisms. These organisms should be typed in every case and the author is of the opinion that the necessity of surgery in the individual case in the future will depend upon the results of serum therapy to a great extent.

As regards the question of surgery the author's material disclosed that 67 per cent of the 56 patients operated upon in the acute stage i.e. in the first three days died while 1 (14 per cent) of 7 patients operated upon during the abscessed stage died all of the 4 patients who were not operated upon died. However the number of cases in these groups is rather small and it is admitted that the most fulminant cases have the highest mortality and these are just the patients who would enter the hospital first and he operated upon earliest. All in all the author believes that more experience is necessary before a definite conclusion as to the time for operation can be reached although he seems to incline along allegedly with an always increasing number of other physicians toward the conservative side.

JOHN W. BRENNAN M.D.

## GASTRO INTESTINAL TRACT

Jones F. A. Hematemesis and Melena Salt and Water Requirements *Brit M J* 1939 2 332

An examination of the post mortem records of fatal cases of hemorrhage from simple peptic ulceration at St Bartholomew's Hospital over the period from 1931 to 1935 revealed data suggesting that in 18 of 39 cases the hemorrhage had ceased at the time of death and many of the patients had not lived for some days previous. Therefore it was surmised that other factors might have been present which led to the death of these patients. The evidence suggests that dehydration may have played an important part.

Examination of the post mortem records revealed that many cases of hematemesis and melena have

ended fatally when the hemorrhage apparently had ceased. A careful analysis revealed that severe dehydration was the common factor in such patients and that symptoms were masked by the liberal administration of opiates. This dehydration was partly due to an insufficient fluid intake and partly to forced diuresis. The latter presumably resulted from a greatly increased excretion of urea possibly caused by the digestion of blood in the bowel.

It should be the rule that patients should receive enough fluid to meet the normal requirements of the kidney, skin and lungs and also to cover any abnormal fluid loss. It is recommended that they be given 10 gm. of sodium chloride daily during the first few days after the hemorrhage.

JOHN W. ALLEN, MD

Rieder, W. *Unsettled Questions on the Surgery of Gastric and Duodenal Ulcers. Surgical Healing of Gastric Ulcers in the Cardiac Region* (Stintige Fragen in der Chirurgie des Ulcus ventriculi und Ulcus duodeni. Chirurgische Behandlung des Cardiacen Ulcus ventriculi). 63. Tag d. deutsch. Ges. f. Chir., Berlin 1939.

A discussion of the surgical treatment of ulcers in and about the cardiac end of the stomach requires a definition of the ulcers which should be considered truly cardiac because it is well known that the ulcer pathology with its inflammatory infiltration of the gastric wall often extends further than is apparent from x-ray study. For this reason the same difficulties are present in the resection of an ulcer which is apparently subcardiac as in the resection of one that is truly cardiac.

This consideration includes ulcers in the upper third of the stomach with a separate discussion of the atypical subcardiac ulcers seen in gastric volvulus with or without relaxation of the diaphragm or with a true diaphragmatic hernia. Clinical and pathological studies have demonstrated that from 6 to 8 per cent of all gastric lesions are in the cardiac region. The Leipzig material of 126 cases included 2 or 6 per cent subcardiac lesions.

The clinical findings associated with lesions in the cardiac region are mild as a rule. There is a characteristic radiating pain into the scapular regions to the sternum to the heart or to the left arm which symptom has led to confusion with angina pectoris in the diagnosis. Twenty-five per cent of the subcardiac lesions in the Leipzig Clinic were associated with a marked hyperacidity and in the remainder the acid values were normal or low.

Diagnosis is best established with the x-rays in the cases with ulcers which are high in the cardia but even with the x-rays there are marked difficulties in differential diagnosis because lesions on the posterior wall are covered by the liver and spinal column as well as by irregular heavy folds of mucosa. Then again there may be deep diverticula which often cover and enclose the ulcer. The occurrence of subcardiac outpouchings which appear temporarily and usually are functional is also a fact well known.

During the last four years the Leipzig Clinic had 3 patients with this condition 2 of whom were operated upon because the roentgenologist believed they had ulcers located high in the cardia. Despite careful examination and exploration of the open stomach during the operation no ulcers could be found. This functional condition occurs frequently but disappears with anesthesia. Similar sac-like pouches have been described by Moulber and Debray as recesses. For this reason unless the ulcer is confirmed by surgical exploration errors in diagnosis are readily possible and permit the impression that healing has followed conservative measures. It must be an inviolate rule not to operate upon high cardiac ulcers without two or three attempts at cure by medical therapy. Good results have however been reported in the treatment of these ulcers by jejunal sound feeding.

Two basic attacks may be utilized in surgical therapy: (1) radical intervention with removal of the ulcer and (2) measures by which the healing of the ulcer follows changes in physiology. Exclusion or purse-string suture of the ulcer is not done at the Leipzig Clinic because of the understanding that the ulcerative disease is not a local disease but an organic one. The purely local measures have been followed by a large number of unsatisfactory results. In addition the sleeve resection of Riedel and Payr has been abandoned because it also was followed by recurrences.

In an early series of 6 high cardiac ulcers in the Leipzig material which were now restudied from twelve to sixteen years after the operation 1 patient remained perfectly well for twelve years, 1 had persistent pain 2 have definite ulcer recurrence and 2 ten years after operation were cachectic principally because of stomach pathology.

On account of the better understanding of the underlying physiology cardiac ulcers are now treated by subtotal gastric resection the circular form of the gastric outlet being maintained as well as possible.

A step-type of resection done without clamps has been developed. When the author does this step resection he partially closes the open end of the stomach at the lesser curvature and endeavors to be sure to prevent leakage from the dangerous lesser-curvature edge. Whenever possible he attempts to use healthy gastric tissues on the greater curvature so that he has now developed a surgical technique which he calls the step-forming or tube resection (Schmieden-Neugebauer-Kirschner). Two step-forming clamps are used in this resection.

Review of the world's literature shows that a subtotal step resection of the stomach and a resection making the stomach tube-like in form are the two most commonly used procedures for these ulcers located high in the cardia. From 1915 to 1939 30 of these ulcers were resected with an operative mortality of 16.5 per cent the total mortality for gastric surgery from 1926 to 1935 was 3.4 per cent. More than 90 per cent of the patients who survived were restored economically. It is of major im-



portance that the patients be in good pre operative condition and not too old

For that group of patients in whom radical attack is inadvisable, jejunostomy is recommended. It affords an immediate response which is fair, but sooner or later relapse occurs. Jejunostomy or gastrostomy may however be replaced by jejunal sound therapy. Gastro enterostomy is usually followed by bad results because the gastro enterostomy itself does not have the ability to change the gastric function sufficiently for the healing of these lesions.

Knowing that the pyloric antrum plays an important role in stimulating the fundal secretion, Kelling for the first time in 1915 performed palliative resection of the pyloric region. This trend was followed by Madlener, who showed that, regardless whether a palliative resection is done with restoration of the gastro intestinal continuity, by means of either a Billroth I or Billroth II type of stoma it is essential to remove at least one half of the stomach. The time proved viewpoint that at least two thirds of the stomach must be removed is still correct. Madlener has reported excellent late results and a low mortality in a large series of palliative resections. The literature contains reports of 120 cases operated upon by the Madlener technique. The operative mortality was 17 per cent and most of the patients have remained symptom free.

A review of the tube type of resection and palliative resection shows equally satisfactory end results from both methods. The greatest objections to palliative resection are the dangers of hemorrhage, perforation, cancerous changes, and cicatrization. In 120 cases treated by palliative resection there were 4 malignant degenerations, in which however, there may have been an error in the original roentgenological diagnosis. The most satisfactory end results have followed high resection, but this should be done only by qualified experienced surgeons in properly selected patients who of course have not been helped by conservative measures. Should the technical difficulties be such that the mortality of radical intervention is too high the palliative resection of Kelling Madlener may be utilized as a life saving measure except in those patients to which there is a suspicion of malignancy. In this type of patient the author utilizes radical surgery despite all hazards. If the patient's condition is such that even palliative resection is too formidable and if jejunal sound therapy cannot be used jejunostomy remains. Gastro enterostomy for these cardiac ulcers is unsatisfactory and is to be done only in the presence of pyloric stenosis in patients who are poor risks.

(W. RIEDER) SAMUEL J. FOULSON, M.D.

**Fromme A.** Palliative Resektion (Gastroenterostomie oder Palliativresektion (bessere Nomenklatur: Resektion zur Ausschaltung R z A) beim nichtresorbierbaren Ulcus duodeni?) 63. Tag d. deutsch. Ges. f. Chir. Berlin 1939.

In every large surgical clinic there are many patients with gastric and duodenal ulcer and the sur-

geon must decide whether the ulcer lesion itself can or should be resected. Operability rests upon the degree of involvement of the adjacent organs. Of major importance is extension of the ulcerative process to include the pancreatic ducts which have many variations as shown by Claremont. The proximity of the ulcerative process to the common duct and to the blood vessels must also be considered. After resection the problem of adequate duodenal closure requires major consideration because experience has shown that inadequate closure is a most frequent source of peritoneal complications secondary to gastric resection. The technique for avoiding these complications with methods developed in the past few years by Nissen was presented by the author.

After consideration of the dangers associated with a radical operation the surgeon may choose a less hazardous routine as, for example, resection to exclusion or gastro enterostomy. The advantages and disadvantages of the above methods were presented. With each of these the ulcer remains *in situ*, and the dangers of hemorrhage, perforation or carcinomatous development still remain. Cancerous changes in a duodenal ulcer occur rarely but this possibility cannot be completely disregarded inasmuch as Fromme has had 2 such complications in his material.

The most feared late complication is gastro jejunal ulcer, which may occur after either resection to exclusion or gastro enterostomy. It is much less frequent after the former than after the latter. The difference in incidence of postoperative gastrojejunal ulcer may be caused by the fact that resection to exclusion removes much of the antrum, and the antrum is a major factor in ulcer development because of its stimulating effect upon the fundus to secrete hydrochloric acid. The site of transection in resection to exclusion may be in the duodenum, pylorus or antrum. When it is in the duodenum there is no greater likelihood of gastrojejunal ulcer than after the most radical surgery because practical experience has shown that within a very short while the ulcer which is left behind will heal. Similar healing follows transection through the pylorus but if the separation is made in the antrum, hyperacidity may still occur with gastrojejunal ulcer formation.

In the more popular technique the line of section is from 3 to 4 cm orally from the pylorus in the antrum. With this technique there results a small antral pouch formation. This may be filled by food or bile and pancreatic juice which may back up, and all these factors together cause acid stimulation in the duodenum segment. Thus there occur factors similar to those present following a von Eiselsberg unilateral exclusion type of operation which had to be abandoned because of the frequency with which it was followed by peptic jejunal ulcers.

The Finsterer method of resection to exclusion is based upon the von Eiselsberg operation. Finsterer however has utilized an extensive gastric resection

to decrease the development of peptic jejunal ulcers. It seemed more logical to Fromme not to reduce the size of the fundus even though it is the source of the acid but to reduce the size of the antral segment from which the stimulus for acid secretion arises. This was done by extirpation of the mucous membrane. The author therefore recommends the technique described by Wilmans, Druener, Buerkle de la Camp, Plenk *et al*, namely extirpation of the mucous membranes as far as possible up to the pyloric ring.

At the same time the author expresses himself as being opposed to unduly large resection of the stomach in resection to exclusion as well as to too large a resection in the radical operation. Because of fear of the rarely occurring later complications of jejunoepiploic ulcer following resection so much stomach is taken away that not only is a digestive organ sacrificed but also an organ with many other functions. The factor for the development of a postoperative ulcer in the jejunum rests in disturbed motility which is very unlikely following the type of Billroth I operation recommended by Holmeister. In this procedure a short loop of bowel is utilized for a posterior gastroenterostomy without the addition of an enteroanastomosis.

In the last sixteen years the author has operated upon 382 patients with duodenal ulcer of which 50 per cent or 190 had radical surgical intervention with a mortality of 3.7 per cent. 88 or 23 per cent had resection to exclusion with a mortality of 6.8 per cent and 104 or 27 per cent had a gastroenterostomy with a mortality of 5.8 per cent. In later years gastroenterostomy was practically replaced by resection to exclusion and only 7 cases treated by this method has developed a peptic jejunal ulcer whereas in a similar period of observation 22 per cent of the patients undergoing gastroenterostomy were proved surgically to have peptic or jejunal ulcers.

The author therefore concludes that a definite percentage of duodenal ulcers do not lend themselves well to an extensive resection which is too hazardous. When a duodenal ulcer cannot be resected or can only be resected with extreme hazard a resection to exclusion should be done. It is essential that in this operation no antral mucous membrane and no antral cavity for acid stimulation be left. For this reason when the site of transection is in the antrum the mucous membrane and the small remaining antral rest must be extirpated. Gastroenterostomy should be considered only for those cases of duodenal ulcer in which resection to exclusion is not possible or in which more extensive surgery is too hazardous. It may be used only in old patients in whom hyperacidity cannot occur.

(A. FROMME) SAMUEL J. FOGELSON M.D.

Cave H. W. Chronic Intractable Ulcerative Colitis  
A Surgical Problem. *J Am M Ass* 1939 113  
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Many forms of treatment have been recommended for chronic ulcerative colitis and not infrequently

certain of these measures are followed by temporary improvements. More frequently the cycle of the disease continues and progressing pathological changes thwart the efforts of the physician and destroy the health of the patient. It is impossible to say that after any interval of respite the disease will not recur.

The writer has reviewed a series of 257 cases, 158 of the patients were treated at the Roosevelt Hospital with a gross mortality of 7 per cent. Six patients in this group died while under medical supervision a mortality of 3.7 per cent. Twenty-seven patients were operated on and 5 of these died giving an operative mortality of 18.5 per cent.

Although 27 patients operated on for this disease represents a small number, the author believes that it is of sufficient size for the formulation of certain conclusions. If the condition of such desperately ill patients cannot be controlled completely by medical management, surgical intervention may be necessary. Surgical intervention is indicated for perforations, repeated hemorrhages and strictures for diffuse polyposis with or without malignant involvement and for conditions not relieved by medical management. Operative procedures must be based on and determined by the extent and situation of permanent damage to the colon. Both preoperative and postoperative medical supervision is essential to a successful outcome for many patients are dehydrated, anemic and septic.

If the colon and rectum are involved only on the left side, transverse colectomy with removal of the colon and rectum on the left is justified. Should the colon be diseased on the right side and the rectum and sigmoid colon are not involved, ileosigmoidostomy followed by subtotal colectomy is sufficient. With extensive disease of the entire colon, removal of the affected bowel is accomplished in three or four stages.

Of the 27 patients operated on 5 died giving an average mortality of 18.5 per cent. An average gain in weight of 42 lb. and marked clinical improvement seem to justify surgical intervention in selected cases.

JOHN W. NUZUM M.D.

#### LIVER GALL BLADDER PANCREAS AND SPLEEN

Smith H. P., Ziffren S. E., Owen C. A. and Hoffman G. R. Clinical and Experimental Studies on Vitamin K. *J Am M Ass* 1939 113 380

It is the purpose of the authors to discuss the bleeding tendency often present in patients having biliary fistulas or obstructive jaundice. In many of these patients death results from persistent hemorrhage which is frequently initiated by operation or follows operation. It is now definitely known that the bleeding results from an abnormal lowering of the plasma prothrombin level and that in most cases this bleeding can be relieved with Vitamin K. The authors outlined a simple method devised for the recognition of deficiency of Vitamin K.

Vitamin K deficiency is to be suspected in all patients presenting biliary fistulas or obstructive jaundice. The degree of deficiency is greater in cases of long duration, but it is sometimes marked when the obstruction is of recent origin i.e. of two or three weeks duration. In the presence of a Vitamin K deficiency it is important that patients receive Vitamin K therapy for several days before any operative procedures are undertaken. The ordinary tests for the bleeding and clotting time reveal the abnormality only when the prothrombin deficiency is extreme. They give normal values when the plasma prothrombin level is merely approaching the danger zone. Therefore, these tests fail when they are most badly needed. The two stage technique for the titration of prothrombin gives the most exact measure of Vitamin K deficiency yet devised. However the method is too complex for routine clinical use. The authors have recently devised a test carried out on the whole blood at the bedside which is relatively simple and efficient.

With a serological pipette, 0.1 c.c. of thromboplastin is placed in a small serological tube. In the tube is then placed blood, freshly drawn from the patient up to the 1 c.c. mark on the side of the tube. The tube is at once inverted over the finger to obtain complete mixing of the blood and the thromboplastin. Next the tube is tilted every second or two in order to observe clotting. As a control the test is also carried out on the blood of a normal subject. The calculation is as follows: if the patient's blood clots in forty eight seconds and the normal person's blood in twenty four seconds, the clotting action is calculated to be 50 per cent normal. The experience with a large group of patients having biliary fistulas or obstructive jaundice shows that bleeding commonly occurs when the test gives values of 40 per cent or less. In extreme cases the level falls as low as 15 per cent of normal while values of from 40 per cent to 70 per cent are definitely in the danger zone.

**Therapeutic use of Vitamin K.** Vitamin K is readily obtained in crude form by the extraction of alfalfa meal. It can be purified by a variety of chemical procedures. One of these preparations in capsule form and dissolved in oil, is already on the market. Much is still to be learned about the amount of Vitamin K to be administered. Some Vitamin K is formed by intestinal bacteria and some is present normally in the diet hence the daily feeding of bile prevents the fall of prothrombin incident to biliary fistula. Feeding bile also restores the prothrombin level to normal in cases in which it has already fallen to lower levels. To obtain a rapid rise in the prothrombin level the writers administer daily the Vitamin K extract from 300 to 400 gm. of alfalfa meal. Evidence now at hand indicates that this dosage is much larger than that employed by some other workers.

In treating patients bile or bile salt must be fed along with the vitamin to aid in the absorption of the

latter from the intestine. It is customary to feed daily at least 1 oz. of bile or its equivalent in the form of dried bile or bile salt. The rate at which the plasma prothrombin level rises with Vitamin K therapy varies in different patients. A definite rise occurs in the majority in twenty four hours but from three to eight days of treatment are usually required to obtain the maximum response. Also it should be emphasized that vitamin treatment should be continued during the postoperative period especially if bile continues to drain from the wound.

Finally it should be mentioned that Vitamin K is of no value in the treatment of hemophilia or thrombocytopenic purpura. In these diseases there is no deficiency in Vitamin K and no deficiency in prothrombin. In cirrhosis of the liver or severe cases of hepatitis the "factory" that forms prothrombin is disordered and the disease is not essentially one of Vitamin K deficiency.

JOHN W. NUZUM M.D.

Biehl M. Incomplete Reversed Eck Fistula in Human Beings (Inkomplette umgekehrte Ecksche Fistel beim Menschen) 63 Tag d. deutsch. Ges. f. Chir. Berlin 1939.

There are two types of experimental Eck fistula. The first is the true Eck fistula (lateral anastomosis between the portal vein and the vena cava with ligation of the portal vein above the anastomosis). Such a fistula has been made a few times in human patients, all of them with liver cirrhosis and ascites, and all of them died after days, weeks or months. The other type is the reversed Eck fistula (lateral anastomosis between the portal vein and the vena cava with ligation of the vena cava above the anastomosis). The principle of this operation has not heretofore been employed on human patients. Biehl carried out many such operations upon dogs however during the period from 1927 to 1930 not only in the Marburg and Koenigsberg clinics but also at the Mayo Clinic with Mann, a well known American investigator of the subject.

In the course of these observations Biehl was impressed by the fact that in animals the true Eck fistula was always accompanied by severe manifestations: emaciation and tissue intoxication. The reversed Eck fistula on the other hand was followed by a good general condition of the animals, a maximal gain in weight, a great appetite and assimilation of a variety of diets. Under the impression of these observations it occurred to Biehl that the reversed Eck fistula might be of benefit to human beings. In theory he believes that it might be of value in the following conditions: (1) very severe cases of hepatogenic jaundice, (2) very severe cases of hemolytic jaundice, and (3) very severe cases of pernicious anemia.

In the course of several years Biehl could apply the operation to cases only of the first group.

In July 1935 he operated in Koenigsberg upon a twenty eight year old patient who had been deeply jaundiced for three months and was in a desperate

condition from every standpoint. At operation he found nothing except the classical picture of hepatogenic jaundice. He determined to perform the reversed Eck fistula. It appeared that in man anatomical considerations were such that a complete ligation of the vena cava should not be done and accordingly after doing a lateral anastomosis between the vena cava and the portal vein he partially ligated the vena cava above the anastomosis diminishing it to the caliber of a lead pencil (so called incomplete reversed Eck fistula). The patient died four weeks later of a progressive thrombosis of the vena cava and portal vein. This thrombosis was evidently due to the then imperfectly performed technique of vessel suture, the too narrow anastomosis and the too great narrowing of the vessel caliber.

In Magdeburg Biehl encountered a quite similar case of hepatogenic icterus in April 1938. This time he again performed the reversed Eck fistula making the stoma between the vessels as large as possible and constricting the vena cava above the anastomosis to the size of the index finger. The operation proceeded very smoothly from a technical standpoint. The sixty-four year old man lost his jaundice quickly and was cured and today one year after operation enjoys the best of health. He has gained 50 lb. regaining his former weight. During the daytime he develops edema of the ankle which disappears after a night's rest in bed. There is no ascites.

Biehl does his vessel suture with the open technique and draws the vena cava and portal vein up into the wound with the aid of tape. The critical part of the operation, during which the great vessels are completely shut off for a time, is aided over with a transfusion and the administration of intravenous fluids. The rationale behind this reversed Eck fistula operation is to supply the injured and malfunctioning liver cells with the greatest amount of blood possible. It may be that the toxic substances absorbed from the intestine and perhaps responsible for the liver injury are beneficially diluted by the vena caval blood and rendered less noxious. Biehl believes that all human patients with jaundice due to primary liver disease should be given the benefit of this operation. He does not believe that the true Eck fistula is of value in such case.

(MAX BIEHL) AUGUST JONA Jz MD

Goumain and Poinot. A Rare Form of Acute Cholecystitis. Hemocholecystitis (Une forme rare de cholecystite aigue l'hémocholécyste). *Bordeaux chir.* 1939 10 169.

Hemocholecystitis was first described by Naunyn in 1892 and may be defined as intravascular hemorrhage. Cormioley in 1927 and Fiessinger *et al.* in 1937 presented collective reviews of this subject. The authors observed a case in a woman seventy-two years of age who was admitted to the hospital for symptoms of acute peritonitis which had been present for twenty-four hours. She had been seized

suddenly with violent pain in the epigastrium and vomiting which was at first alimentary and later bilious. She had been on a diet for dyspeptic disturbances and suffered annual attacks lasting from four to five days with vomiting but no particularly characteristic symptoms. There had been no jaundice and no discoloration of the stools. However during an attack eight years previous to admission which had lasted for eight days the stools had been discolored although there was no jaundice. Upon palpation of the abdomen it was observed that the right hypochondrium was less mobile than the left and there was muscular resistance in the right subumbilical region associated with purely local pain. This picture of right peritonitis with the dyspeptic history suggested perforated ulcer or a possible cholecystitis. Operation revealed a very dark gall bladder which yielded blood on puncture. A retrograde cholecystectomy was done. The patient was discharged in good condition after three weeks following a smooth recovery. She died about a month later of bronchopneumonia.

Hemocholecystitis is very rare and only about 40 cases have been reported in the literature. It cannot be diagnosed clinically as a rule. Chiray has emphasized the severe state of shock with a rapid fall in the pulse rate followed by a very painful tumor in the right hypochondrium which becomes progressively larger. Chiray likewise emphasizes the hard consistency of the gall bladder but this is very difficult to demonstrate because of the defensive rigidity of the abdominal wall. The diagnosis usually established is that of acute cholecystitis or gangrene of the gall bladder and it can be corrected only at operation.

As regards the pathogenesis, two types of hemocholecystitis have been differentiated according to whether or not calculus could be regarded as a causative factor.

In the calculous type of hemocholecystitis the hemorrhage is the result of an erosion of the mucosa of the gall bladder in the absence of an inflammatory process or hemorrhagic syndrome. Small mechanical hemorrhages are found. The history of the patient usually reveals symptoms of calculus. The gall bladder is large, distended and of a purple color. The hemorrhage appears to develop more by transudation than by actual erosion. In addition to the mechanical hemorrhage there may be hemorrhage of infectious or toxic origin. In the latter might be included infarcts of the gall bladder. Still another pathogenetic factor is perivascular sclerosis. These factors may operate alone or in combination. The course of the condition varies as a rule the hemorrhage remains intravascular and only rarely appears as melena. Intrapertoneal rupture with hemoperitoneum has also been reported as rupture into the intestine. The treatment consists of cholecystectomy much facilitated by the absence of adhesions and inflammation. In infected hemocholecystitis in debilitated patients it might be preferable to begin with a cholecystostomy with drainage of the in-

fects bile. This is advisable particularly in the presence of calculus of the choledochus.

EDITH SCHANCHÉ MOORE

Walters, W. *Surgical Treatment of Diseases of the Bile Ducts*. *Surg Clin North Am* 1939 19 845

The author cites cholangitis as being defined as an inflammatory process occurring in and around the walls of the intrahepatic biliary passages the pathologic changes of which vary from simple catarrhal involvement of the lining epithelium to periductal fibrosis and thickening of the duct walls lymphocytic infiltration and even abscesses in and about the biliary passages.

Catarrhal choledochitis is the inflammation of the common bile duct which accompanies catarrhal cholecystitis.

One type of choledochitis with associated cholangitis is usually found in association with subacute pancreatitis, and is described as noncalcareous inflammatory biliary obstruction associated with cholecystitis.

Suppurative cholangitis is a very serious condition most commonly occurring in persons past middle age.

The diagnosis may be difficult sometimes it can not be made before operation or necropsy reveals the true pathological condition. Suppurative cholangitis should be suspected if severe constitutional symptoms develop in a person who has a history of cholelithiasis or choledocholithiasis or a biliary obstruction caused by a neoplasm. In the cases for which the patients have had no previous surgical treatment malarial and amebic abscess of the liver must be ruled out.

The author believes that treatment is best directed toward prevention by means of early attention to disease of the biliary tract removal of a diseased or stone filled gall bladder and relief of obstructive lesions of the biliary tract as soon as the diagnosis can be made and before this serious condition has developed. T tube drainage of the common bile duct may be advisable. In an occasional case of tumor of the head of the pancreas producing biliary obstruction cholecystogastrostomy or choledochoduodenostomy may be done. If the suppurative is extensive and multiple abscesses have developed surgical intervention may seem useless, but recovery may occur with drainage of the common duct and the large abscesses. Medical treatment has not been of much value in the past but it is to be hoped that sulfanilamide will be of aid in the future.

Choledocholithiasis is the most common pathological condition found affecting the bile ducts.

The symptoms resulting from the presence of stone in the common duct vary with the degree and type of obstruction produced.

Extrusion of a stone into the duodenum is signified by abrupt cessation of the colic and gradual and complete clearance of the jaundice within a few days time. Unless another stone descends from the gall bladder there will be no further jaundice,

although symptoms referable to the gall bladder may continue.

The most characteristic type of obstruction caused by stone of the common duct is produced by the ball valve action described by Fenger in which the stone intermittently blocks the lower end of the common bile duct until sufficient accumulation of bile above the blockage point and consequent dilatation of the duct release it.

The author holds that a consideration of choledocholithiasis must include both cases in which the gall bladder has been removed and those in which the gall bladder is still present. A definite clinical diagnosis of stone in the common duct may be difficult to make in cases in which the gall bladder is present since all the symptoms of choledocholithiasis including jaundice can be produced either by calculous or non calculous cholecystic disease. However since surgical intervention is always advisable in these cases the common duct can always be examined at the time of cholecystectomy and the presence or absence of stone in the duct can be determined.

Enlargement of the common bile duct is an almost infallible indication that obstruction is or has recently been present.

Exploration should include (1) the passage of graduated scoops through the lower end of the duct and into the duodenum to prevent the overlooking of small stones impacted in the ampulla of Vater, (2) dilatation of the sphincter of Oddi both to prevent postoperative spasm and to allow small overlooked intrahepatic stones to pass through the ampulla into the duodenum.

If cholecystectomy has been previously performed the problem of pre operative diagnosis of stones in the common duct is still not an easy matter. The condition of the gall bladder at the time it was removed and whether or not it contained stones are of importance since non calculous cholecystic disease is only occasionally accompanied or followed by stones in the common duct.

In the author's experience choledocholithotomy can be performed with little more risk than primary cholecystectomy.

Careful examination of the common bile duct should be an integral part of every operation on the biliary tract. If the duct is enlarged beyond its normal size (comparable to that of a goose quill), if a stone is palpable or if there is anything in the patient's history such as jaundice chills, or fever that suggests the possibility of stone in the common duct exploration of the duct should be performed as a routine procedure. Exploration of the common bile duct should also be advised for any patient who has had recurrent and intractable symptoms following a biliary operation of any kind. Other indications for choledochotomy are cases of chronic or subacute pancreatitis or chronic or acute cholangitis.

Stones in the common and hepatic bile ducts whether they are free or impacted single or multiple situated in the supraduodenal, pancreatic or intra

mural portions are best removed by supraduodenal choledochotomy. The author's experience is that it should be possible to remove stones in almost any conceivable situation in the ducts through a supra duodenal incision.

It has been the author's practice to open the gall bladder and remove its stones first so that they will not enter the common duct during exploration. The disposition of the gall bladder after the removal of its stones should be left until the common and hepatic ducts have been effectively treated. Palpation of the common bile duct is then carried out by introducing the index and second fingers of the left hand into the foramen of Winslow and with the thumb above the hepatoduodenal ligament gently compressing the duct between the thumb and fingers. By working upward to the longitudinal fissure and downward to the end of the common bile duct the duct may be allowed to slip through the fingers. It is surprising with what accuracy small fragments of stone may be detected. The elusive single floating stone may be milked upward from the pancreatic portion and fixed in a favorable position for removal.

It is frequently difficult or impossible to feel a single small stone in the lower end of the common bile duct or in the ampulla of Vater before the duct is opened. If the duct is enlarged or if there is a clinical history of recurring chills and fever and jaundice the author opens the duct even though a stone cannot be felt. With a probe or a scoop in the common bile duct as a guide a small stone may often be palpated that otherwise could not be felt. An exceedingly difficult and serious operation can often be made simple and safe if the stone in the common bile duct is located by palpation and if the surgeon works from the outer right side of the abdomen toward the duct at a depth of approximately that of the common bile duct. By grasping the duct and fixing the stone between the fingers of the left hand the surgeon can open the duct and remove the stone by cutting directly down upon it. The stone or stones immediately present in the opening are removed and the bile and loose debris are gently sponged out. Scoop of various sizes are then introduced into the common and hepatic bile ducts and all remaining free stones are carefully removed with as little manipulation as possible. Not infrequently a scoop or probe will pass by a stone giving the surgeon the impression that a stone is not present. For this reason it is important to make the incision in the duct large enough to admit the finger provided that the duct itself is sufficiently dilated. By using the forefinger as a probe the surgeon can be almost certain that the interior of the duct is clear. Removal of a stone or stones from the ampulla of Vater is most easily accomplished by first passing a scoop into the ampulla then guiding the scoop with the fingers outside of the duodenum and gradually manipulating the stone until it is crowded into the hollow of the instrument. By maintaining pressure on the anterior surface of the duct with the fingers of the right hand and pressing the scoop and

its contained stone against them with the left hand, it is possible to hold the stone in this position as the scoop is gradually withdrawn. The surest way to palpate a small stone in the ampulla especially when the surrounding pancreatic tissue is swollen is to pass as large a probe as will comfortably fit into the duct down to the ampulla and then palpate the ampulla from without this instrument being left in place as a guide.

Stones in the hepatic duct or those which extend up into the right or left hepatic branches may often be overlooked with the result that they descend into the ampulla and require secondary operations. The stone can usually be brought to the surface by careful manipulation with scoops followed by irrigation of the anterior of the ducts with a syringe attached to a small catheter. Many times it has been possible to flush stones out of the hepatic ducts when they probably could not have been removed in any other way. Although the continuity between the liver and intestine through the extrahepatic biliary tract should be definitely established it is often difficult to be sure that all stones have been removed for even if the greatest care is exercised small calculi occasionally may be overlooked.

External biliary drainage consists of passing a catheter of suitable size through the opening in the common bile duct and up into the hepatic duct. The catheter is stitched in place and the opening in the duct is accurately closed around it. Following this most of the bile drains to the outside through the tube which usually is allowed to remain in place for nine or ten days. At the end of that time bile begins to discharge around it and shortly afterward the tube comes out of its own accord.

For drainage purposes a suitably sized T tube smaller in diameter than the common bile duct is placed in the common duct so that one arm of the cross piece projects up in the direction of the hepatic duct and the other extends downward toward the duodenum. The two limbs of the cross piece are trimmed so that they are about 1 cm. in length. The long arm projects out through the wound. The common bile duct is carefully closed around the juncture of the two tubes so that leakage will not occur.

The author believes that the advantages of T tube drainage over other types of drainage are numerous. In most of the cases in which choledochotomy is indicated there is considerable dilatation of the duct and cholangitis or pancreatitis. These are conditions which are not relieved readily. They are most satisfactorily treated by prolonged drainage of the common bile duct.

Strictures of the bile ducts are commonly classified as to their causes into four main groups, namely: (1) congenital strictures (2) traumatic strictures (3) inflammatory strictures and (4) strictures caused by tumors.

Congenital obliteration of the bile ducts is a rare condition characterized anatomically by closure or atresia of the ducts. Diagnosis usually can be made

by a process of elimination with great certainty by the end of the second month of life. When it has been made, exploratory operation should be recommended.

The incidence of traumatic stricture is low but the author believes that the condition is such a tragic accident that it presents in eloquent argument against the performance of operation on the biliary tract by any but well trained surgeon.

Injury to the common bile duct is usually referable to anomalies of the ducts or adjacent blood vessels which were not recognized at the time of operation; distortion of the parts produced by dissection; attempts on the part of the surgeon to control bleeding in the vicinity of the ducts; or failure to expose adequately the common duct both above and below the cystic duct before the cystic duct is clamped and sectioned. If the common duct is injured under such conditions it should be repaired immediately.

At secondary operation it is often impossible to determine just how the injury occurred. In such cases the ordinary landmarks are obliterated and it is often difficult to identify the distal portion of the duct or even to determine the exact site of the structure. A common site of structure is the junction of the cystic and common ducts and the next most common is the supraduodenal portion of the common duct. Strictures at the papilla or strictures of the hepatic ducts are much less common.

Benign stricture of the ducts is an extremely serious condition since it produces continuous or intermittent biliary obstruction with the added element of extensive and progressive chronic cholangitis and pericholangitis.

Prolonged drainage of bile from the incision after cholecystectomy usually means that in injury to the common duct has occurred or a stone of the common duct has been overlooked.

In addition to care during separation of the gall bladder and the cystic duct from the common duct the author calls attention to certain important general principles in the prevention of stricture: early recognition and early surgical treatment of ducts of the gall bladder and bile ducts; thorough and accurate technique in the surgical procedure; and complete primary operations whenever possible.

The most significant desiderata in the treatment of these patients are immediate drainage of the bile and a permanent passage to the intestine before cure is complete. In the presence of a total biliary fistula of short duration it is frequently advisable to delay the reconstructive biliary intestinal anastomosis until most of the signs of infection in the liver and ducts have subsided. Cholecystenterostomy is rarely practicable because the gall bladder has usually been removed; also if it is present it may be diseased and thus not suitable for anastomosis and the cystic duct may often be obstructed by obliterative inflammation. Elastic enlargement of the structured common duct is usually impossible and rarely satisfactory but transplantation of an

established external biliary fistula into the duodenum for patients having complete structure of the common and hepatic ducts is sometimes attended by brilliant results. From the experimental standpoint, resection of the stricture with immediate end to end anastomosis is the ideal method and when it can be satisfactorily done it is usually successful.

Although resection of the stricture with end to end anastomosis is experimentally and theoretically the ideal method of reconstruction the author believes that practically it has distinct limitations because of the difficulty encountered in the securing of the lower end of the duct and the tendency of the anastomosis to contract and produce subsequent obstruction. If the structure proves to be an annular contraction with a satisfactory length of duct above and below it, however, removal of the structured portion of the duct and end to end anastomosis of the ends of the duct may be attempted. This procedure requires free mobilization of the duodenum; apposition of the ends of the duct without tension; and extreme care of suture. The anastomosis is made over either a T tube or a catheter. If a catheter is used, one end must project beyond the sphincter of Oddi into the duodenum so that it will be pulled out by duodenal peristalsis.

After the structure has been located it may be simply split longitudinally and a T tube or catheter may be inserted in the hope that a permanent tract may develop after long contact with the tube. The author thinks this hope is rarely realized although the immediate result may be good. When intestinal peristalsis pulls the tube out contraction frequently occurs and jaundice once more appears.

According to the author results have demonstrated that the method of hepaticoduodenostomy first successfully performed by W. J. Mayo in 1905, is the most practical, most widely applicable and most successful procedure for reestablishing the natural course of the flow of bile. In the modified form described by C. H. Mayo the inferior biliary portion of the catheter makes an extraluminal anastomosis on which to reconstruct the duct. It will remain in situ longer than the unbandaged portion.

The author believes that when the stricture is found to involve practically the entire length of the duct, the surgeon has to be content either with establishment of an external biliary fistula, to be closed out and transplanted into the stomach or duodenum at a later time, or with creation of a catheter or T tube one end in the intrabiliary duct and the other in the duodenum and bridging the gap between with adjacent tissue and omentum locally.

Before transplanting such a tube, it should first be ascertained that a firm of the common duct distal to it is not possible for the fistula or that there is not sufficient common or hepatic duct remaining above the fistula that might be a site for anastomosis of the duct to the duodenum, a procedure which produces better results than biliary fistula transplantation.

If biliary fistula transplantation is decided upon the tract should be coned out a considerable thickness of tissue being left around it which allows the tract to remain attached to the liver. This is done to keep the fistulous tract open and to preserve its blood supply. As soon as the coned out fistulous tract has been sufficiently mobilized the nearest accessible portion of the stomach or duodenum is approximated and a stab wound is made into it at a favorable spot. A silk suture is passed through the end of the coned out tract and this is brought through the opening in the duodenum or stomach and carried out again through the intestinal wall about 2.5 cm. lower in the same manner as that used in urethral transplantation. The fistulous tract then should be pulled through the opening in the wall of the stomach or duodenum by the silk suture which is so tied as to hold the end of the artificial duct inside of the lumen of the stomach or duodenum. Interrupted suture then close the opening in the intestine around the tract and further protection is afforded by a small piece of omentum.

Both benign and malignant tumors of the bile ducts occur occasionally and produce biliary obstruction. The benign tumors most frequently found are papillomas, lipomas, fibromas, xanthomas and adenomas.

Malignant strictures of the bile ducts occur as a result of intrinsic carcinoma of the wall of the ducts or of extrinsic carcinoma arising in adjacent organs, most frequently in the pancreas but occasionally in the stomach and duodenum. Exact diagnosis in such cases the author believes is not of great importance except in an academic sense. As soon as the diagnosis of obstructive jaundice has been made and the moment is opportune surgical exploration should be carried out. Tumors situated in either the right or left hepatic duct are usually not accessible for removal. The most that can be accomplished is curettage of a portion of the carcinoma until a flow of bile is obtained and then the long arm of a T tube is inserted up past the growth for drainage purpose.

The author believes that for the surgical treatment of tumors of the cystic duct, cholecystectomy with removal of the entire cystic duct is the operation of choice.

Tumors involving the common bile duct theoretically can be treated by the same operation used for radical resection in the group of tumors previously mentioned but in practice this is rarely feasible. When a tumor has involved the common duct there is the advantage that cholecystenterostomy is usually possible and sometimes this procedure offers more benefits than resection. Cholecystenterostomy is a much safer and a more satisfactory procedure; it will relieve the jaundice and pruritus and is preferable to hazardous radical resection.

Of the palliative operations, cholecystostomy or internal drainage by cholecystoduodenostomy, cholecystogastrostomy or choledochoduodenostomy have long been the chosen methods of treatment.

The author defines cholecystenterostomy as essentially the same as any lateral anastomosis in which three rows of suture are used. He says that the operation can be accomplished with or without the use of a Doyen clamp. If it is done without the clamp a suction pump can be employed to empty the gall bladder and stomach of their contents. Before the stomach and gall bladder are opened gauze packs should be inserted into the left and right subhepatic fossae and the general peritoneal cavity to prevent leakage during the operation. The contents of the distended gall bladder are removed by means of a trocar and cannula which are introduced into this organ at a point at which the perforation can be included in the anastomosis. The gall bladder and stomach or the gall bladder and small intestine either duodenum or jejunum are approximated with either Doyen clamp or interrupted sutures at points immediately beyond what are to be the extremities of the anastomosis. A running silk suture through the serosa of the gall bladder and stomach or duodenum is used as the first row of sutures posteriorly. After this row has been inserted an incision is made through the peritoneum and muscle of the gall bladder and stomach or bowel and these tissues are approximated by a continuous suture of the packing type extending backward and joining the submucosa and mucosa. This suture controls bleeding from the posterior wall of the anastomosis. The same suture is continued across the anterior edge of the anastomosis as a running suture, the mucosa being everted. The second row of stitches anteriorly approximate the muscle and peritoneal layers and the third row anteriorly approximates the serosa of the viscera immediately beyond the second row. It may be advisable to place interrupted sutures at the angles and portions of the gastrohepatic omentum may be used as a patch to cover the anastomosis. Tension on the anastomosis may be prevented when cholecystogastrotomy is required by attachment of the anterior wall of the stomach to the falciform ligament of the liver by a few interrupted suture, it thus being kept to the right of the spinal column.

Transduodenal excision has been the most frequent method of removal of malignant tumors of the terminal portion of the common duct or of the ampulla of Vater.

Recurring attacks of pain simulating biliary colic and occurring subsequent to operations on the gall bladder are usually the result of stones which have been overlooked in the common bile duct. The other demonstrable causes of pain referable to the biliary tract are pancreatitis, stricture of the common bile duct, ulcers of the posterior duodenal wall which penetrate the pancreas and biliary dyskinesia.

The management of patients suffering from abnormal function of the sphincter of Oddi and of the duodenum is still somewhat obscure. Good results have followed forceful dilatation of the sphincter of Oddi and prolonged drainage of the common bile duct with a T tube. The author believes the safest



way to treat such patients is forcefully to dilate the sphincter of Oddi to a diameter of 8 mm with a series of graduated scoops or sounds and then to institute prolonged T tube drainage.

The author thinks that visualization of the common bile duct by injection of roentgenologically opaque media into it through a tube placed in it at the time of operation has been of great value in reducing the incidence of recurring pathological change in the extrahepatic biliary tract.

Meyer May J. Attenuated Pancreatitis (Les pancreatites atténuées). *J de chir* 1939 54 1/4

Meyer May describes a form of pancreatitis—sometimes acute or subacute and sometimes chronic—which is little understood. The acute form is to be distinguished from acute hemorrhagic pancreatitis the clinical and pathological characteristics of which are much better known.

At Hanoi, Tonkin French Indo China 27 cases of this form of attenuated pancreatitis have been observed in which the symptoms were characteristic of pancreatitis 9 of these cases were operated upon and the diagnosis was confirmed. In addition a number of cases of gastroduodenal ulcer have been observed in which the symptoms indicated an involvement of the pancreas 6 such cases have been studied recently. The chief symptoms of pancreatitis are attacks of pain above the umbilicus usually severe which are increased by pressure and radiate toward the lumbar region a rapid loss of weight the inability to eat meat or fats, fetid stools and dilatation of the transverse colon. Examination of the blood shows a definite hyperglycemia. Study of the duodenal contents obtained by the duodenal tube shows a marked deficiency of all the pancreatic ferments, especially of lipase. In the acute form operation is often done at the time of the first or of recurrent attacks all the 9 cases operated upon in the author's series were of the acute type. In the subacute type the attacks of pain are less severe but they recur often the pain is increased by pressure in the region of the pancreas and the patient loses weight rapidly. In the chronic form there are repeated attacks of epigastric pain, not very severe which often recur at long intervals the stools are fatty, the appetite is poor and there is a gradual loss of weight. In the author's cases of this type the presence of intestinal parasites usually the ascariis was demonstrated. Roentgenological examination of the gastro-intestinal tract showed no lesion and the gall bladder filled normally. In cases in which pancreatitis is associated with gastric ulcer two types of pain are noted the typical ulcer pain and a more diffuse epigastric pain not related to the ingestion of food which occurs at different times of the day and also during periods when the ulcer symptoms are quiescent.

When the clinical symptoms suggest the presence of a pancreatic lesion a study of the blood sugar to determine whether hyperglycemia is present and an analysis of the duodenal contents for the pan-

creatic ferments should be made. When these tests support the diagnosis of pancreatitis, insulin should be given as a therapeutic test. Even in acute cases insulin may relieve the symptoms so that operation is not necessary. In subacute and chronic cases insulin is given in daily doses of from 15 to 45 units under careful control of the blood sugar. When the blood sugar is reduced to and maintained at a normal level the insulin treatment is stopped. Under this treatment the pain and other symptoms are relieved the patient gains weight, and analysis of the duodenal contents shows a marked increase in the pancreatic ferments. If operation is necessary in acute cases, the author advises careful exploration of the pancreas and the biliary tract drainage of the gall bladder which is generally distended, and closure of the wound without other drainage. Of the 9 patients treated by this method 6 recovered.

In 4 of the acute cases of pancreatitis which were operated upon and in 6 cases associated with ulcer biopsy of the pancreas was done. In these cases there was either diffuse edema with congestion of the blood vessels in the more acute cases or sclerotic lesions such as induration. In no instance were there hemorrhagic lesions or necrosis which fact distinguished this type of pancreatitis from acute hemorrhagic pancreatitis. ALICE M. MEYERS

Griesmann H. The Diagnosis and Treatment of Acute Diseases of the Pancreas. Report on 80 Cases of Acute Diseases of the Pancreas Observed at the Giessen Clinic During the Years from 1931 to 1937 (Zur Diagnose und Therapie der akuten Pankreaserkrankungen. Bericht ueber 80 in den Jahren 1931-37 an der Giessener Klinik beobachtete faelle akuter Pankreaserkrankungen). *Deutsche Zeitschrift f. Chir.* 1939 252 19.

In recent years surgical intervention in acute pancreatitis has been put in the background and has given place to expectant treatment that is the diseases of the biliary tract underlying the disease have been operated upon only after the recession of the acute symptoms in more than 90 per cent of the cases. The author reports on 80 cases observed at the Giessen Clinic during the years from 1931 to 1937 which were at first treated expectantly. In the years from 1909 to 1930 74 cases were operated upon immediately after establishment of the diagnosis. In 50 patients there was an acute necrosis, and in 30 an acute edema. The increased frequency of the disease is attributed to the improvement in the conditions of nutrition during the period mentioned and it should also be taken into consideration that the diagnostic procedures have been made more exact. In accordance with the much more frequent occurrence of disease of the biliary tract in the female sex there is also a much more frequent occurrence of disease of the pancreas in this sex.

In 46 of the 58 cases operated upon namely, in 79.3 per cent small gall bladder concretions were found and in 7 only a solitary stone was found. No calculus was observed in only 5 cases. Only in 6

per cent of the cases did the common bile duct contain a stone in 16.8 per cent a dilatation of the common bile duct was observed and in 33.3 per cent jaundice was reported in the previous history as an expression of a disturbance in the biliary flow. The pancreatic complication occurred in the predominant majority of the cases with small concretions in the gall bladder after a comparatively short duration of the basic disease. In 60 per cent of the cases which were operated upon extensive adhesions around the gall bladder were not observed. In one half of the cases (47) the pancreatitis appeared in the first two years of the biliary tract disease a previous history was very rare.

Inasmuch as there may be no previous history or the general condition may make the diagnosis impossible the diagnosis of pancreatitis must be established with the new methods which is practically always possible. For this purpose there is first the demonstration of the increased amount of diastase in the urine which is determined according to Wohlgemuth units. Only values above 256 are considered as being definitely increased. They must be determined by persistent examination—twice a day under certain conditions—and only then can so called fermentation variations be excluded and definite conclusions drawn. Values exceeding 1,024 were found in 43.3 per cent of the cases of edema of the pancreas previous to the operation and in 76 per cent of the cases of acute necrosis and values exceeding 512 were found in 79.9 per cent of the former and in 84 per cent of the latter. In contrast to this only 28.5 per cent of the cases of disease of the biliary tract alone showed values between 512 and 1,024 and 17.1 per cent showed higher values. Following a suitable operation on the biliary tract a rapid fall in the values was demonstrable only 10.6 per cent of the cases of necrosis still showed an elevation above 1,024 and 6.8 per cent of the cases of edema showed a marked increase of the diastase and this immediately after the intervention. However it must also be emphasized that the test for diastase failed to give information in 18 per cent of the cases of necrosis and in 20 per cent of the cases of edema. For this reason the clinical picture must also be taken into consideration.

While the increased values for diastase may again rapidly sink to normal this is not the case with the atoxyl resistant lipase in the blood serum. The test is therefore carried out regularly even though it is more troublesome and time consuming and under certain conditions it may show positive results also in diseases of the biliary tract and in gastric and duodenal ulcers perforating into the pancreas. In the latter cases however the high values obtained in pancreatitis are never achieved. The disturbances in the carbohydrate metabolism may become apparent in a spontaneous or alimentary appearance of glucose in the urine or in the elevation of the fasting blood sugar above 120 mgm per 100 ccm. This elevation of the blood sugar content was found present in the 70 cases examined for it in 26.6 per cent

of the cases of edema of the pancreas and in 37 per cent of the cases of necrosis of the pancreas. Sugar was found in the urine only once in the first group and it was of the alimentary type. In the second group the spontaneous appearance of sugar was noted in 3 cases and in 9 cases it appeared in the alimentary form.

The functional blood sugar test proposed by Bernhardt in 1926 with 50 gm of glucose showed entirely different results. In this test the blood sugar content is estimated after forty five sixty seventy five and one hundred and twenty minutes and is compared with the fasting blood sugar. With this test there is an increase both in the cases of edema and necrosis which is always much higher in the latter and the peak of the curve is observed in an average of sixty or seventy five minutes. This weakened tolerance for sugar readjusts itself in edema after about five or six weeks. In 10 per cent of the cases operated upon because of necrosis of the pancreas diabetes was demonstrable in the functional glucose tests and in an additional 10 per cent of the cases a weakened tolerance was demonstrable. In a follow up investigation carried out recently on 22 patients who were operated upon normal or almost normal blood sugar values were observed in the functional tests. In one case only a slight increase in the blood sugar content was found after eight years in another case a considerable increased value (functional test) was found seven years later but this value could be influenced dietetically to such a degree that after an additional eight years normal blood sugar values were found. In a third case normal values were still demonstrable fourteen years after the operation while nineteen years later a fasting blood sugar value of 154 mgm per 100 ccm and a urinary sugar value of 5.4 per cent were found. Only the result of the functional blood sugar test is to be considered as a definitely diagnostic sign.

In the presence of edema an increase in the number of the white blood cells to figures between 15,000 and 20,000 was demonstrable in 72.4 per cent of the cases and in cases of necrosis an increase to over 25,000 was demonstrable in 38.8 per cent of the cases. Hence the demonstration of a very marked increase of the leucocytes indicates the presence of the severe form of pancreatic disease. In the latter there is also a marked increase of the urobilinogen as well as excretion of albumin and an increase of the residual nitrogen in the blood.

If the presence of disease of the pancreas has been recognized with the aid of all these diagnostic aids the expectant treatment with the avoidance of the administration of all fluids by mouth and in its place the administration of fluids by rectal drop infusions should be begun. This is to be carried on for about three or four days and in addition atropine is given for the sedation of the vagus nerve and morphine in large doses for the relief of pain. When the acute attack has passed the operation on the biliary tract should be done as soon as possible and for that reason the patient should remain in the hands of the

surgeon. As soon as the diastase values have become normal intervention should be made, there is no need for waiting for normal values of the blood sugar because these may be delayed for a long time. However, the circulation must first have definitely recovered. Eleven days was the average time which elapsed before operation. Under these precautions the operative mortality in cases of acute necrosis was reduced from 34 to 13 per cent. It should also be mentioned that in 0.1 of the operations carried out on the biliary tract without involvement of the pancreas necrosis of the pancreas developed (6.6 ooo in a space of thirty eight years).

(BUDDE) LOUIS NEUWELT M.D.

Piessinger N. Bergeret A. and Cattani R. Adeno-Epithelioma of the Body of the Pancreas. Surgical Excision Cure (Adeno-épithéliome du corps du pancréas. Excision chirurgicale. Guérison). *Bull. et mem. Soc. med. d. hôp. de Par.* 1939 55 729

A forty two year old woman had suffered for about six months with vague gastro intestinal symptoms. Medical examination revealed a mass in the epigastrium which was assumed to be the hypertrophied left lobe of the liver in view of the in-



Fig. 1. Roentgenogram of the stomach (AP) deformity of the lesser curvature caused by the tumor pressure.



Fig. 2. Macroscopic aspect of cut section of the tumor.

cidental finding of amebas in the stools. However with increasing loss of weight and failure of response to amebicides a more careful examination including x-ray studies (Fig. 1) revealed a tumor mass pressing up behind the lesser curvature of the stomach. About eight months after the onset and the institution of varied treatments surgical intervention was decided on. Under spinal anesthesia supplemented by nitrous oxide a well demarcated tumor was extirpated from the tail of the pancreas (Fig. 2). Histological study showed it to be a cylindrocubic epithelioma.

A perusal of the literature indicates the extreme rarity of the condition. It is most unusual for a cancer of the body of the pancreas to be palpable through the abdominal wall. Some authors speak of encysted epithelioma in describing such cases. The authors suggest that the present case was a pancreatic adenoma with secondary malignant degeneration. In the entire literature only 3 cases of epithelioma of the body of the pancreas with attempt at surgical removal have been found. Three of these patients survived more than two years. 1 of them died nineteen years later of bronchopneumonia. It seems that certain forms of cancer of the body of the pancreas are readily extirpated surgically and offer a favorable prognosis.

The authors present a detailed discussion of the operative findings, histology and general literature.

JACOB E. KLEIN, M.D.

# GYNECOLOGY

## UTERUS

**Horalek F** The Cause of Retroflexion of the Uterus (*Zur Aetiologie der Retroflexio uteri*) *Verhandl d international Kong f Geburtsh* 1938 2 58

According to the view of the author retroflexion of the uterus is not a disease in itself but only a symptom of derangement of the sympathetic nerve tone. The pelvic nerve is responsible for the tone of the cervix. If it is blocked by lumbar anesthesia a relaxation of the cervix and an increase in the extent of the fundus tone occur. On the other hand a chronic hypertonicity of the cervix coincident with a permanent atony of the fundus may produce a retroflexion because the round ligaments are also relaxed. This is caused by excessive parasympathetic stimulation of the cervix and is regarded as an acquired essential imbalance of the sympathetic nerve tone. The following is given as proof of this statement:

In the course of laparotomy done under lumbar anesthesia for the correction of retroflexion the uterus is regularly found in the normal position and reposition can be obtained following sufficient manipulation to cause the fundus to contract. After the administration of belladonna suppositories and the quieting of the over-tight parasympathetic nerve retroflexion is more easily corrected just as correction of retroposition is easier when the intestine and urinary bladder are emptied before the cervix is dilated. The atony of the fundus ceases in all of the cases. Retroflexion may be an expression of general hypertonicity of the sympathetic system caused by increased tone of the cervix. All of the cervical trauma and laceration of childbirth act to further this result. They lead to chronic atony of the fundus and retroflexion. Congenital retroflexion is thus understood to be an expression of the lack of normal sympathetic tone due to an immature organ. Treatment of the retroflexion should consist of belladonna therapy, relief of the congested circulation and improvement of the sympathetic tone with diathermy, warming of the feet and various pharmacological agents. The healing of cervical erosions with the electrocautery may also prove of value. Operative treatment is permissible only after conservative measures have failed and the surgeon is convinced that no underlying factors have been overlooked as it is to be regarded only as a supportive measure and is not directed at the underlying cause. (REDEZ) *August 1938 J. N. M. D.*

**Van Gulik P J** Martzloff's Grading of Squamous Cell Cancers of the Collum Uteri with Regard to Prognosis and Irradiation Treatment *Acta radiol* 1939 0 276

Of 180 patients with squamous cell carcinoma of the cervix uteri all of whom were treated only by

irradiation in the Antoni van Leeuwenhoekhuis Hospital of Amsterdam 66 or 36 per cent showed five year cures. Martzloff's system of grading was employed in studying the histological sections (The predominant cell type of the malignancy determines the grading). Starting from the normal epithelium of the portio one sees 3 distinctive cell types: (1) the outer layers of large polyhedral cells with distinct cell membranes and intercellular ridges (epithelial cells); (2) a thin layer of small roundish cells (transitional cells); and (3) the basal layer with deep staining oblong nuclei (pindle cells).

In general irradiation technique is as follows:

In the course of from two to three weeks 4,500 mgm/hr of radium element are given to the portio and about 2,400 mgm/hr are given in the canal in three or four sessions of about thirty hours. In this period roentgen therapy is started and the pelvis is irradiated from four external fields of 15 by 15 cm. Six weeks after the first series of treatment a second series of roentgen treatment equal to the first is given i.e. a total of 8,000 roentgen. Occasionally radium needles are inserted into the remaining tumor by means of laparotomy.

Grading of squamous cell carcinomas with regard to their prognosis and treatment with radiant energy was rather disappointing. It was of no use for individual prognosis but may be of some value for group. The relative radio sensitivity of the Grade III cancers is offset by their tendency toward early metastasis and the grading of such carcinomas might be appreciated more if one could detect metastases sooner. (S. BLAKE M.D.)

**Healy W P and Brown R I** Experience with Surgical and Radiation Therapy in Carcinoma of the Corpus Uteri *Am J Obst & Gynec* 1939 39 1

Carcinoma of the corpus uteri is in most instances a postmenopausal disease and uterine bleeding is its most constant symptom. Postmenopausal bleeding should at once suggest the presence of carcinoma of the corpus even though the patient has a readily palpable fibromyomatous uterus. These two conditions were found to be associated in 38 per cent of the cases in this series.

Pain would appear to be an important prognostic factor. Sixty six per cent of the patients complaining of pain at the time of first examination died of carcinoma later. In nearly half of these initial examination revealed no evidence of extension of the carcinoma beyond the uterus. The 107 cases of carcinoma of the corpus uteri on which this study has been based fall readily into three principal histological groups.

Approximately one half of all the cases presented adenoma malignum, one fourth adenocarcinoma Grade II and approximately one fourth adenocarcinoma

cinoma Grade III or IV. The histological type bears a direct relation to the chance for cure and is of definite prognostic importance. The five year survival rate for adenoma malignum is appreciably higher than that for adenocarcinoma Grade II and this survival rate for adenocarcinoma Grade II is higher than that for adenocarcinoma Grades III and IV. The results in a small series of cases of adenocarcinoma indicate the prognosis in this group to be nearly equal to that in adenoma malignum.

It appears worthwhile from both a prognostic and a therapeutic standpoint to subdivide the cases into clinical groups according to the size of the uterus and the palpable extent of the disease. If the uterus is not larger than the size of a two and one half months gestation and if there is no evidence of extension of the carcinoma beyond the uterus the five year survival rate is 60 per cent if it is based upon the entire series of 197 cases without regard to method of treatment if it is based on results in a smaller series of cases treated according to what is regarded by us as the preferred method of treatment it is 88 per cent. If the uterus is larger than a two and one half months gestation our findings indicate that the chance for cure from radiation alone is extremely low. If there is palpable extension of the carcinoma beyond the uterus the chance for five year survival is approximately 10 per cent.

Radiation alone has definite curative value in cases which for one reason or another cannot be subjected to subsequent panhysterectomy the five year survival rate for the group of 96 patients treated by radiation alone being 39 per cent. When only clinical Groups I and II are considered the five year survival rate is 56 per cent and the five year cure (free from all evidence of carcinoma for five years or more) is 47 per cent.

Intra uterine radon usually not less than 3 600 millicurie hours supplemented by roentgen ray treatment and followed by panhysterectomy seems to offer the greatest opportunity for cure. Seventy nine per cent of the patients so treated have survived five years or more and 75 per cent have been free from all evidence of carcinoma for more than five years. The risk of major complications seems slight.

EDWARD L. CORNELL, M.D.

#### ADNEXAL AND PERIUTERINE CONDITIONS

Fauvet E. The Enlarged Ovary (Ueber das grosse Ovarium). *Arch f Gynaek* 1939 168 414.

Seven cases of ovaries larger than normal are described. They are classified according to the views of Bartel and Hermann who distinguish between the ovary which is larger than normal because of an increased amount of connective tissue, which is therefore not of functional importance and the ovary which is enlarged because of cystic follicles.

In the first case reported an ovary of a sixteen year old girl was interpersed with vesicular follicles. According to the author the diagnosis of cystic degeneration for this ovary should be challenged in

asmuch as only a temporary condition was found to be present.

Cases 2 and 3 presented ovaries in which an edema of the ovarian stroma had occurred as a consequence of para ovarian cysts so that the entire ovary was enlarged.

Case 4 was that of a thirty year old woman who had died of eclampsia and in whom the ovaries were filled with vesicular follicles. Of special significance in this case was the presence of a large corpus luteum in spite of which there was a striking development of vesicular follicles. This occurrence is not possible according to the theory of Stieve.

In the fifth case both ovaries were removed from a twenty year old girl because of the diagnosis of malignant tumors. Both ovaries consisted almost entirely of connective tissue. All stages of rapidly growing and degenerating follicles were found but no corpora lutea. The scar formation was responsible for the ovarian enlargement and gave the false impression of a tumor.

The last case was that of a twenty five year old woman from whom one ovary had been removed on suspicion of a fibroma and the larger portion of the other ovary resected for the same reason. Microscopically there was no sign of tumor formation but the condition was one of enlarged ovaries. The remainder of the ovary left *in situ* later underwent cystic degeneration and was removed.

(FAUVEY) RONALD R. GREENE, M.D.

#### MISCELLANEOUS

Heiberg B. Positive Friedman Reaction in a Case of Corpus Luteum Cyst. *Acta obst et gynec Scand* 1939 19 176.

The author reports the case of a woman twenty five years of age who presented symptoms of extra uterine pregnancy. The Friedman reaction was positive. On laparotomy the lesion was found to be a corpus luteum cyst. There were no signs of concurrent pregnancy. On the basis of this case and other cases in the literature mention is made by the writer of the differential diagnostic difficulties between the two lesions.

A positive Friedman reaction taken as a positive reaction for pregnancy may occasionally be misleading as the urine of patients with corpus luteum cysts may give a positive reaction to this test. The question is discussed as to whether the pituitary gland is involved in the pathological processes. In the case here reviewed the rate of metabolism was increased. This together with the positive Friedman reaction and perhaps the very formation of the corpus luteum cyst constituted the only symptoms of deficiency in the balance of the endocrine system.

The positive Friedman reaction is due nearly always to excretion in the urine of a hormone produced by chorionic tissue. Under normal conditions it is true that the pituitary gland produces hormones that may give the same reaction but the excretion of these hormones with the urine is so slight that

the reaction fails to appear for quantitative purposes. However in certain abnormal cases associated with a hyperproduction of gonadotropic hormones, for example in ovarian dysfunction a positive Friedman reaction may be obtained as an expression of an abnormal state of the pituitary gland, and not as usually an expression of hormone production by chorionic tissue in the organism of the patient. Such a reaction may be mistaken for evidence suggestive of the diagnosis of pregnancy.

The author notes that a positive Friedman reaction may appear also in patients suffering from a dermoid cyst of the ovary.

A review of the few cases collected from the literature reveals what is shown in the case reported herewith—that there is one more group of ovarian cysts viz. the corpus luteum cysts in the presence of which the urine of the patient may give a positive Friedman reaction. HERBERT F. TRUSTOV, M.D.

**Turpault.** The Use of the Male Hormone in Women with Particular Reference to the Treatment of Hemorrhage (*L. hormone male chez la femme spécialement dans les hémorragies*) (*Gynecologie* 1939 18 281).

Turpault has used testicular extracts since 1931 but with the isolation of the crystallized product

(testosterone), in 1935 he began to use this more powerful drug. The formula is given as  $C_{19}H_{28}O_2$ . Testosterone tends to decrease the action of the ovarian and hypophyseal hormones and through the use of as much as from 50 to 60 mgm. a month the author has attained good results in the control of uterine bleeding in the so-called functional cases of hemorrhage. He has also had successful results by the use of testosterone in hemorrhage caused by fibroma with doses of from 50 to 500 mgm. a month.

The conditions in which testosterone is indicated are diseases of the breast, uterine fibroma, functional uterine hemorrhage (especially during puberty or at the menopause), intermenstrual crises, uterine hyperplasia, nervous upsets (either menopausal or sexual) and menopausal difficulties whether caused by surgical or radium treatment or by natural changes.

The author advises that the testosterone be given two or three days before the expected appearance of the symptoms. There are some inconvenient effects from this drug such as (1) fatigue, (2) excitement, (3) involvement of the liver, (4) the rare occurrence of vocal changes in which the voice becomes lower in pitch, and (5) development of the clitoris.

FREDERIC W. ILFELD, M.D.

# OBSTETRICS

## PREGNANCY AND ITS COMPLICATIONS

Strauss M B. The Toxemia of Pregnancy. *Am J Obst & Gynec* 1939 38 199

The term toxemia of pregnancy is a misnomer. Approximately 85 per cent of the cases so classified are cases of primary vascular or renal disease. In such cases changes in the water balance do not affect the signs or symptoms. A large proportion of the remaining 15 per cent are cases in which the patients are suffering from water retention. This may be due primarily to low plasma proteins or to excessive sodium intake or in many instances to both factors. Measures which lead to further water retention increase the severity of the toxic manifestations whereas measures which result in the loss of excessive retained water result in an amelioration of these manifestations. A low sodium intake is one means of eliminating undue water retention. The development of water retention toxemia may be prevented by the maintenance of the pregnant woman's plasma proteins at a normal level with an adequate diet and the avoidance of excessive sodium ingestion.

In the discussion HILLMAN states that he does not agree with the view that the edema is responsible for the toxemia. Hypoproteinemia frequently results from the loss of protein through the kidneys in addition to the factors mentioned.

STANDER has been unable to convince himself that a reduction in the total serum proteins is responsible in many cases of pre-eclampsia for the marked increase in body weight due to water retention. There appears to be enough evidence at present to ascribe to the sex hormones an ability to regulate in part at least the excretion of certain of the inorganic ions Na, K, and Ca as in the case of the adrenal cortex hormone or hormones.

EDWARD L. CORNELL M.D.

Dieckmann W J and Brown I. The Obstetrical Management of Patients with Toxemia. *Am J Obst & Gynec* 1939 38 214

The average maternal mortality in representative hospitals for non-convulsive toxemia of pregnancy is 1.7 per cent. The mortality reported by the authors for preventable deaths is 0.4 per cent. One half of the immediate deaths were due to infection, the remainder to heart disease and/or anemia.

More than 13 per cent of the toxemic mothers were discharged without a living baby. Seventy per cent of the dead fetuses weighed less than 2,500 gm, but this group comprised only 20 per cent of the series. The fetal mortality for all fetuses weighing more than 1,000 gm was 8 per cent, more than 1,500 gm 6 per cent, and more than 2,500 gm 3.9 per cent. Toxemia does cause an increased fetal mortality.

Cesarean section yielded the lowest mortality for fetuses weighing from 1,000 to 1,999 gm (31 per cent) and for those weighing more than 4,000 gm (0 per cent). The mortality for viable fetuses was 12 per cent.

Normal labor gave the lowest mortality for fetuses weighing from 2,000 to 3,999 gm (3 per cent). The mortality for viable fetuses was 5.2 per cent.

Induction of labor gave a high mortality in all weight groups and is now used only in selected cases.

The fetal and neonatal mortality for the first five years was 15.5 per cent and for the last two years 7.2 per cent. Similarly the mortality for fetuses weighing more than 1,500 gm was 6.8 per cent for the first five years and only 2.3 per cent for the last two years.

Labor should be induced only in suitable cases that is there should be no cephalopelvic disproportion, the fetal position should be a normal one, and the cervix should be ripe (effaced, soft and dilatable). Rupture of the membranes and if contractions have not started at the end of twelve hours the injection of 1 or 2 minims of pitocin at thirty minute intervals until uterine contractions occur every three or four minutes, or until 8 doses have been given is the safest method. Occasionally when rapid delivery seems imperative a bag may be inserted within the uterus.

Cesarean section should be used only in the pre-eclamptic patient when eclampsia seems imminent and delivery through the vagina seems unwise. It is also indicated in the interest of the baby in patients with essential hypertension or vasculorenal disease if delivery is necessary before term and the cervix is not ripe. Sterilization as an indication for the operation is unwarranted.

The morbidity for all patients amounts to 7.5 per cent but for toxemic patients alone the morbidity is 32 per cent. This high incidence of fever is due primarily to the excessive vaginal manipulation and the high operative rate in toxemic patients.

The duration of labor in toxemic patients is longer than normal.

The weight gain in normal pregnancy should amount to the weight of the products of conception and of the physiological changes associated with pregnancy.

The weight of the fetuses from toxemic patients is as a rule less than the average for the period of pregnancy. These babies are immature rather than premature and are usually much more vigorous than their weight warrants. A high carbohydrate diet during early pregnancy may be of value in producing a larger fetus in patients with vasculorenal disease.

No drugs which depress the respiratory center such as morphine, hyoscine ether and paraldehyde should be used before delivery if the pregnancy is

being terminated prematurely Magnesium sulfate or sodium luminal may be given intramuscularly if convulsions seem imminent Analgesia may be obtained with intermittent gas anesthesia Episiotomy is especially indicated in the delivery of the premature baby

Prenatal care should be intelligently administered in order that abnormalities of weight blood pressure and urine may not only be recognized but their importance appreciated and proper treatment instituted

EDWARD L. CORNELL MD

#### Dix V W and Evans H Ureteric Catheterization in Pyelitis of Pregnancy *Lancet* 1939 237 176

From 1934 to 1937 at the London Hospital 84 cases of pyelitis of pregnancy were admitted One of the postnatal and 7 of the prenatal patients did not respond to the ordinary medical treatment with adequate fluid bed rest and alkali Five of them had such severe vomiting that oral administration of the drugs was impossible Ureteral catheterization was used successfully in all 9 cases and in each instance it was the right kidney pelvis which was drained

A rapid and striking regression of the symptoms and signs followed the mechanical drainage and in no case was it necessary to interrupt pregnancy The catheter was left *in situ* for three or four days and the authors believe that an even shorter time might well be employed with but slight extra risk of recurrent stasis In no case was it necessary to repeat the procedure

The treatment with alkali was continued during and after catheterization and it is pointed out that although probably no medication would have helped during the acute stage the sulfanilamide and mandelic acid groups may be very helpful in clearing up the residual infection Unless the remaining infection is carefully attended recurrence is of course quite probable

No anesthetic was used during the cystoscopy but one must remember that especially when the fetal head is in the pelvis expert manipulation is paramount and an anesthetic may be indicated

I S BIRCH MD

### LABOR AND ITS COMPLICATIONS

#### Consoli D Cervical Dystocias (*Le distocie cervicali*) *Arch di ostet e ginec* 1939 3 193

Consoli thinks that it is advisable to classify dystocias of the cervix into anatomical dystocias due to congenital or acquired causes and functional dystocias in which the alterations occur during labor

The first type (anatomical organic and static) may be due to (1) congenital rigidity which may be constitutional or caused by defects in form (2) acquired rigidity having a pathological cause such as generic or specific inflammatory processes (gonorrhea and syphilis) neoplastic processes (fibroma, cancer and previous labors) and cicatricial processes

due to surgical intervention (trachelorrhaphy and amputation of the cervix) and to chemical agents (potassium permanganate and Filhos caustic) or physical agents (radium and diathermocoagulation) (3) longitudinal hypertrophy and coherence of the cervical borders (4) results of interventions on the uterus (5) ventrofixation and hysteropexy and (6) deviations of the cervix

The second type (functional and dynamic) may be due to (1) defective adaptation of the presenting part and total or essential uterine dyscinesia either primary or secondary (2) cervicosegmental or high cervical spastic condition either total or partial (3) low cervical spastic condition either total or partial and (4) edema of the cervix

The frequency of occurrence of cervical dystocia necessitating surgical intervention amounts to 17 per cent and its total frequency is consequently much higher The course of uterine contractions is greatly altered in cervical dystocia in some cases from the beginning of labor and in others during some phase of labor and the changes in the cervix vary according to the cause of the dystocia For instance in spasm of the external orifice the cervix is well flattened and the borders of the orifice offer an abnormal resistance to attempts at digital dilatation in cervicosegmental dystocia the spastic circle is felt above the external orifice or at the level of the internal orifice under the form of a diaphragm or a spur Premature rupture of the membranes occurs frequently in cases of cervical dystocia and is caused by abnormal adhesions of the membranes to the cervix

Trophylaxis includes all the gynecological measures to be taken in the presence of any inflammatory neoplastic and cicatricial disorders such as early and thorough treatment of infections and tumors immediate repair of lacerations avoidance of mutilating interventions (the preference going to plastic repair) and the cautious use of chemical and physical agents In functional dystocia incorrect and brutal vaginal attempts at manual dilatation must be condemned The prognosis of the dystocia can be given only approximately after observation of the development of the course of labor and consideration of its various individual elements

The treatment rests on the same foundations and depending upon the individual case will consist of expectation with attempts at medical therapy or active intervention by the vaginal route (artificial dilatation of the cervix and extraction of the fetus) or by the abdominal route (cesarean section) In primary hyperkinetic cases the medical treatment should include the administration of anti spasmotic drugs without the exaggerated use of opiates In hypokinetic cases anti spasmotic drugs are indicated for the slow and nearly continuous molestation of slight contractions with a feeling of pulling in the lumbar region and the lower abdomen Stimulating drugs especially in the beginning of labor are dangerous It is rarely necessary to take recourse to artificial rupture of the membranes but there are



exceptional cases in which the integrity of the membranes clearly prevents dilatation of the cervix. In case of adhesions between the cervix and the amniotic sac, it is advisable to separate them cautiously while keeping the membrane intact.

RICHARD KEMEL, M.D.

#### PUERPERIUM AND ITS COMPLICATIONS

Brown C. E. and Eder L. F. Acute Puerperal Hypophyseal Necrosis with the Report of a Fatal Case. *Am J W Sc* 1939 198 166

Acute necrosis of the anterior lobe of the pituitary gland in parturient women is not common, but Sheehan in 1937 reviewed the literature and added 11 cases from the Royal Glasgow Maternity Hospital, in which death followed delivery after a period of from fourteen hours to thirty days.

The authors report the case of a patient who died ninety-three hours post partum in whom the only apparently significant finding at autopsy was acute thrombosis and necrosis of the anterior pituitary lobe. The prominent symptoms were first nausea and vomiting, probably explained by an ileus which was completely relieved with a Levine tube by

forty-four hours after delivery. The general condition of the patient did not improve. She was restless, confused, and complained of severe headache. On the third day, in spite of continued adequate intravenous fluids, a second blood transfusion and ephedrine, the systolic pressure stayed below 90, and on the fourth and last day the blood pressure readings dropped as low as 50/20. She became drowsy and cyanotic, and extreme hypotension persisted until death. The fluid output was concomitant with an adequate intake, and on the last day the blood picture was red blood cells 4,100,000, hemoglobin 82 per cent and white blood cells 15,000.

The local irritation and endocrine deficiency resulting from the above anatomical lesion may well explain the salient features of headache and hypotension. It is suggested that this condition may be a more common puerperal complication than is generally recognized. Should the puerperal course of a woman progress unfavorably without apparent cause, the authors suggest the possible efficacy of blood sugar studies, active glucose therapy, and the administration of anterior pituitary extracts.

E. S. BURGE, M.D.

# VESICO-INTESTINAL FISTULAS

## A Review of the Literature, Including 21 Cases of the University Hospital

HARRY PETERS Jr M D San Francisco California

**V**ESICO INTESTINAL fistulas are relatively infrequent though reports go back for many years. As early as the second century the Ephesian physician, Rufus mentioned that Praxagoras had seen a case of vesico intestinal fistula. In the seven-teenth century the German practitioner Schenckius of Freiberg observed in a fellow physician a case of an enterovesical fistula secondary to a sigmoidal neoplasm. In the same century the Italian physicians Cardano and Benivene independently reported similar cases. A short time later other cases were added by Boyer De Sault and Chopart. One of the first accurate and authentic descriptions was given by Frank in 1786. Sydney Jones's case in 1858 was a vesico intestinal fistula on the basis of diverticulitis and was confirmed by autopsy. There were thus only a few isolated reports prior to Blauquinque's article *Fistules Vesico Intestinales* in 1870.

It was not until 1885 that a comprehensive study on this subject appeared in the form of *The Passage of Air and Fecal Matter with the Urine* which was written by the famed physician Harrison Cripps. He expounded on the 63 cases he was able to collect and many of the principles and facts as set forth by him remain unchanged to this day. Sporadic works appeared subsequent to Cripps monograph. Chavanne in 1897 presented an excellent treatise and Pascal in 1899 wrote a review based on his survey of 280 cases. Shortly after this interest was aroused in the American and British surgeons and such names as Parham Hume Chute McKenna and Judd became prominent. Heine's paper in 1904 was one of the first to accentuate the importance of diverticulitis in the etiology of these fistulas. Prestaveco's search of the literature in 1912 yielded but 42 cases to add to those collected by Pascal. In 1915 Cunningham's paper brought the subject matter fairly well up to date and no major contributions have been made since that time. In 1916 433 cases were collected by Albano and additional reports followed by Lockhart Mummery Norburg Dobson Moir Willan

Leland Coetsch and Colby totalling 573 cases up to 1936. Higgins 35 cases Balch's 19 and 21 from the University of California Clinic<sup>1</sup> with the addition of isolated case reports since 1936 make a total of slightly over 600 cases available for study.

It will be noted that there is a discrepancy between the number of cases reported in the literature and those considered in this study. This discrepancy arises from the fact that many cases were incompletely followed up, or insufficient information was included in the reports to warrant their use. In this paper an attempt has been made to offer an unbiased summary of accurate clinical data appearing in the literature.

### SEX AND AGE

Reports vary considerably regarding the occurrence in the two sexes. Cunningham reported the incidence as 3 in females to 1 in males. Conversely Pascal Bryan and Higgins each reported a predominance in males in the ratio of 3 to 1. Of 542 cases analyzed in this paper 381 or 70 per cent occurred in men and 161 cases or 30 per cent in women.

The incidence was found to be greatest in the sixth decade the ages varying from birth to seventy years with an average age of fifty one years.

### ETIOLOGY

A review of the literature and a compilation of 463 cases the etiology of which was reasonably assured made Table I possible.

The congenital cases of which 25 appear in the literature are confined to imperforate anus. These constitute 7 per cent of the total.

Fistulas resulting from trauma constitute 19 per cent of the total. Surgical manipulation accounts for almost one half of these cases. Of the non surgical or accidental causes gunshot wounds play the predominant role.

As is well borne out in the literature vesico intestinal fistulas are most often caused by inflammatory processes, and true diverticulitis constitutes the cause in more than two-fifths of the cases. The incidence of diverticulitis has been

From the Department of Surgery Division of Urology University of California Medical School

See also Table I of the cases

TABLE I—CASES OF VESICO INTESTINAL FISTULAS

	Number of cases
I Congenital	25
A Imperforate anus	25
II Traumatic	87
A Postoperative accidents including litholapaxy uterine curettage vaginal hysterectomy catheterization prostatectomy and radium burns	39
B Gunshot wounds	37
C Childbirth	5
D Penetrating wounds of the rectum	2
E Fractured pelvis	1
III Inflammatory	46
A Diverticulitis	104
B Tuberculosis (intestinal tubal vesical seminal vesicular and prostatic)	3
C Ulceration of foreign body from the bowel into the bladder including fish bones gall stones pencils (In 2 of these cases the communication was through the appendix)	31
D Appendiceal abscess	2
I Ulceration of vesical calculus into the bowel	16
1 Neisserian tubal abscess	14
G Diverticulum of the bladder	1
H Syphilis	3
I Actinomycosis	5
J Prostatic abscess	2
K Perineal abscess	2
L Typhoid	2
M Meckel's diverticulum	1

Amebiasis bilharziasis echinococcus disease regional enteritis and ulcerative colitis were mentioned in the literature but these cases were not included in this report for want of sufficient proof

IV Tumors	105
A Carcinoma of the rectum	31
B Carcinoma of the sigmoid	32
C Carcinoma of the bladder	14
D Carcinoma of the cervix	8
E Carcinoma of the uterus	7
F Carcinoma of the prostate	2
G Carcinoma of the vagina	2
H Carcinoma of the ovary	2
I Carcinoma of the cecum	1

reported to vary anywhere from 14 to 50 per cent. Diverticulitis was established as the cause in 23 per cent of the 463 cases reviewed in this paper. In the inflammatory group, tuberculosis the ulceration of a foreign body from bowel to bladder and appendiceal abscess appear in the order named. Though the importance of tuberculosis is emphasized in the literature, it constitutes but 8 per cent of the total in this report, ranking about equally with surgical accidents and gunshot wounds.

In this series the vesico intestinal fistulas secondary to neoplasms were caused by carcinoma. Carcinoma of the rectum was the chief offender and accounted for over one third of these

TABLE II—LOCATION OF VESICO INTESTINAL FISTULAS

Between	Number of case	Per cent
Rectum and bladder (including rectosigmoid)	258	44
Sigmoid and bladder	113	22
Colon and bladder	84	16
Small intestine and bladder	44	9
Appendix and bladder	21	5
Cecum and bladder	13	2

cases. Carcinoma of the sigmoid was responsible in fewer than one third of the cases with carcinoma of the bladder next in frequency. Malignant involvement of the rectum and sigmoid, together, constituted 15 per cent of all the cases recorded. In our own series of 21 cases, 2 followed the use of radium and it is suspected that a greater number of these occurred during the period of enthusiastic radiation than is evident in the literature.

In surveying the foregoing figures, then diverticulitis is seen to be the most frequent individual etiological agent with carcinoma of the rectum and sigmoid surgical accidents and tuberculosis occurring in the order named.

#### PATHOLOGICAL CHANGES

Table II shows the incidence of location in the 499 cases in which the site was determined.

The fistulous tract between the bladder and the intestine may be direct or indirect via a tortuous sinus. The direct communication is usually found in carcinoma and tuberculosis, whether primary in the bladder or the bowel. The tortuous tract occurs secondary to abscess formation with openings into the organs at different levels as is usual in diverticulitis.

The opening into the bladder is usually found in the region of the trigone more commonly on the left side because of the proximity of the sigmoid, less commonly on the posterior wall and least often on the fundus. The inflammatory changes in the bladder depend upon a number of factors: the size of the fistulous opening, the amount and character of the rectal contents passing into the bladder, the presence or absence of urethral obstruction, and the type of infective organism. The pathological findings in the bladder are discussed in detail under the cystoscopic findings in the section on diagnosis.

#### SYMPTOMS

The symptoms of vesico intestinal fistulas can best be discussed in phases: the cardinal symptoms those coincidentally present, and those arising from the primary etiological lesion.

All texts mention 3 cardinal symptoms. In the first that of pneumaturia, manifestations present are the passing of gas along the urethra bubbles in the urine during voiding and froth at the meatus after the act is completed. Pneumaturia is most prominent when the large bowel is affected by the fistula. In itself pneumaturia is not pathognomonic and the following conditions should be ruled out: glycosuria associated with fermentative organisms; recent vesical instrumentation, as with a cystoscope and certain neurogenic atonic dilatations of the bladder.

The second cardinal symptom is the passage of feces by urethra. This complaint like that of pneumaturia is almost invariably present. Variation is wide depending on the size of the communication and the portion of the bowel involved in the fistula.

The third cardinal symptom is the passage of urine by rectum. This was present more often than expected occurring in about one third of the cases. It depends somewhat on the size of the fistulous communication, the presence of obstruction in the lower urinary tract and the association of a long standing cystitis with compensatory hypertrophy and increased intracystic pressure. The single direction of flow is borne out by the fact that opaque dye by rectum will frequently outline the fistula whereas cystograms usually fail. The symptoms of the presence of urine in the rectum are those of proctitis and the toxic effects from absorption are minimal unless the communication is with the small bowel.

A long train of coincidental symptoms may be present. Those most common are secondary to the cystitis and consist of frequency, burning, terminal hematuria and tenesmus if the fecal particles are firm. A foul smell to the urine may be noticed by the patient and a peculiar roaring in the bladder is not infrequently present. Such general symptoms as mental anxiety, insomnia, loss of weight and exhaustion may be present. Many of the foregoing symptoms may exist in the pre-fistulous stage if a primary lesion of the bowel is in close apposition to the bladder.

No discussion is indicated regarding the multiplicity of complaints and variations in the clinical picture as caused by the original lesion. Suffice it to say a careful history usually reveals a vesical or enteric affection previous to the time of perforation. Familiarization with the history is important both from the standpoint of treatment and that of prognosis.

Seminal vesiculitis, epididymitis, and fecal vesical calculus are among the more frequent complications. Ascending pyelonephritis with

its chain of symptoms of chills, fever, pain in the flank, and renal damage should the parenchyma be involved, is peculiarly uncommon. In only 18 of Pascal's 250 cases did this occur and the condition was bilateral in 14 of these 18 cases. Chavany stated that renal infection is not usually found because the bladder maintains control over its infection and colon bacilli introduced through the fistula are less harmful to their host than when distributed by the blood stream.

#### DIAGNOSIS

As can be seen, the diagnosis can often be made with no data further than the history. The physical examination, nevertheless, is important as an aid in the determination of the nature of the primary lesion. The finding of an active tuberculous lesion may be an important lead. The presence of a mass in the right lower quadrant verified perhaps by rectal examination, leads one to suspect an appendiceal abscess, carcinoma or tuberculosis of the cecum. Likewise a mass in the left lower quadrant is suggestive first of diverticulitis of the rectosigmoid. Rectal malignancies are often within reach of the examining finger. A tender mass associated with fever and leucocytosis makes an indirect fistula from an abscess probable. General distention of the colon suggests stenosis, benign or malignant, while distention with peristalsis of the small bowel suggests involvement of a loop of the small bowel.

Of even greater importance for an accurate diagnosis are the laboratory procedures at hand. Routine Wassermann test, complete blood count, and examinations of the urine and stool should always be made as well as tests of the kidney function. Most pertinent is cystoscopic examination combined with sigmoidoscopy, barium enema and cystographic studies. Before the fistula has developed but after the inflammatory tumor has become adherent to the bladder, a localized area of edema with papillomatous like projections of the mucous membrane is usually present in the bladder and may be recognized at cystoscopy. The fistula once established the orifice is most commonly found in the trigonal region especially to the left of the trigone. It may be relatively close to the ureteral orifice at times making catheterization difficult. Feces and air bubbles can be observed emerging from the opening. Inflammatory changes in the mucosa of the bladder are usually marked, varying from simple hyperemia to exuberant granulations, bullous edema, ulceration, necroses and erosions. When the fistula is first established there is usually an acute generalized cystitis. Later, there is a unique

absence of diffuse cystitis. This is accounted for by the absence of distinct lymph channels in the mucous membrane by the presence of a protective non absorbing transitional type of cell, and by the fact that the infective material is constantly being diluted and kept in motion by the ingress and egress of the flow. Catheterization of the fistulous tract must be done with care lest a false channel or even an opening into the peritoneal cavity be made.

Occasionally a cystogram will define the communication and locate its bounds. Of more value is roentgenological examination of the lower bowel, not only in visualization of the fistula, but also in determination of the nature of the vesical lesion. This particularly obtains in the diagnosis and differential diagnosis of diverticulitis and carcinoma.

If cystoscopic examination fails to locate accurately the fistulous opening the administration of an enema of methylene blue during cystoscopic scrutiny may be of distinct advantage.

Sigmoidoscope examination is an aid in the determination of the vesical lesion, but too frequently the enteric opening of the fistula is obscured by mucosal folds and inflammatory edema of the adjacent mucous membrane. Vesical instillation of methylene blue during the sigmoidoscopy may facilitate visualization of the fistulous entrance. In those instances in which the small bowel enters into the vesical communication (approximately 9 per cent) a gastro intestinal x ray series is helpful.

There is no one set outline to follow, each case presenting its own peculiarities, but by the proper combination of some of the procedures mentioned previously an accurate diagnosis can often be made.

#### TREATMENT

The treatment of vesico intestinal fistula is variable depending on the given circumstances in each case. It may be that medical therapy is indicated—palliative, symptomatic, or perhaps anti hectic treatment in the case of syphilis. In other cases surgery, conservative or radical, may be the treatment of choice.

Non operative measures have a restricted indication because (barring those patients who are moribund at the first examination) the great majority require surgical intervention even if it is only palliative in nature. Surgical measures were employed in 45 per cent of the 471 cases considered in this report. This figure is minimized by the fact that in more than 15 per cent no active therapeutic measures were feasible because of the patient's poor condition. Medical therapy is directed toward making the patient comfortable

and is of greatest advantage in inoperable carcinoma and tuberculosis, occasionally it serves as a therapeutic trial in early vesico intestinal fistula secondary to a benign lesion. Medical treatment consists of a non residue diet with restraint of bowel movements, followed in a few days by active drug therapy conducive to loose movements, combined with rectal irrigations. Bladder irrigations and urinary antiseptics are administered and apprehension and pain are allayed by appropriate sedatives and opiates. By this treatment a fairly comfortable existence may be obtained for an extended period of time.

The surgical approach dates back to as early as 1843, when Barbier de Mille suggested colostomy, and Pennel, in 1850 and Curling in 1852, performed that operation. In 1884, Le Dentu attempted transvesical closure of the fistula, but without success, and Boissen, in 1891 effected a cure by a primary closure through an abdominal incision.

At the present time it is recognized that the type of surgery indicated depends principally on the character and extent of the primary lesion. Simple diversion of the fecal stream by colostomy and of the urinary stream by cystostomy is applicable as a palliative procedure in an extensive malignant or tuberculous process if a reasonable prolongation of life can be expected. Of course, this requires knowledge of the location of the intestinal fistula in order that the colostomy may be established above this site. In other cases suprapubic cystostomy alone may be used in palliation of an advanced malignant growth.

For cure of the congenital, traumatic and inflammatory types of fistulas, several lines of choice are at hand. First come methods of drying up the fistula, after which many fistulas will close. Such methods include the use of a retention catheter or, if necessary cystostomy and a non residue diet, or sometimes colostomy to divert the urine and feces. Most tracts kept dry and empty will close spontaneously. Unfortunately, however cystostomy and colostomy will not keep most tracts dry. The surgery of direct closure will depend on the conditions present. For low rectovesical fistula in men the Young Stone operation is highly successful even without colostomy and is to be preferred, therefore, to the surgery for drying up the tracts and permitting spontaneous closure.

Abdominal incision with separation of the bladder and intestine and repair of the openings, or resection of a portion of the gut and bladder to include the fistulous tract has several indications. It is of most value in traumatic and inflammatory processes, especially in appendicovesical fistulas.

This procedure may also be used in certain cases of diverticulitis in which the intestinal involvement is at a minimum

Other cases may lend themselves to the perineal or vaginal approach if the opening is low down. By this method it is usually not possible to close the rectal and vesical openings but by separation of the two viscera packing the wound and packing the rectum above the fistulous opening satisfactory results may be obtained. This procedure must be combined with a non residue diet and adequate tying of the bowels for a period of time sufficient to insure healing of the tract.

Regarding treatment of the most frequent offender diverticulitis one of several methods may be chosen. When an acute inflammatory process is involved it is almost imperative that a preliminary operation be done to divert the fecal stream. If the patient's condition is good and surgical intervention is in the immediate offing, a cecostomy is done. Usually however it is best to divert the fecal stream completely by means of a colostomy and the primary leakage by cystostomy. These procedures alone frequently will cause the inflammatory mass to subside and spontaneous closure of the fistula may occur. If the fistula does not close an exploratory laparotomy is carried out. Examination may reveal only minimal involvement of the bowel in which case it is possible to excise the fistula and close the vesical and intestinal openings. Usually however, the preferred treatment is resection of the involved bowel with its fistulous tract with end to end anastomosis of the colon. This procedure reduces the chance of recurrence and technically is of advantage because normal bowel is being used in the reconstruction.

In respect to operable carcinoma of the recto sigmoid with vesico intestinal fistula the surgical procedure indicated is very much the same as in uncomplicated carcinoma. No lengthy discussion is warranted here regarding the efficacy of resection of the growth with end to end anastomosis or abdominoperineal resection with a permanent colostomy or the numerous other types of operations for malignancies of the rectum and sigmoid colon. The only additional maneuver that may be involved that is in addition to the procedure required by the uncomplicated case of carcinoma is a partial resection of the wall of the bladder where the latter is invaded.

From the foregoing discussion it can be seen that a correct diagnosis as to the primary lesion plays an important part in the type of surgical approach chosen. In this respect Beer of New York City emphasized the importance of obtain-

ing a biopsy of the fistulous tract before operation when possible, in order that the subsequent therapy can be determined.

#### PROGNOSIS

By the very nature of the type of lesion causing vesico intestinal fistulas the prognosis is generally grave both as to life and the likelihood of repeated operations.

In the traumatic variety of vesico intestinal fistula a favorable outlook can be maintained as many close spontaneously and those that do not are usually amenable to surgery. In the inflammatory variety a somewhat less optimistic attitude should be assumed. Spontaneous cure is less common and the success of a surgical procedure is hampered by the fact that the bowel used for suturing is frequently friable and of poor material and a narrowing of the bowel below the lesion is often present and tends to increase the pressure on the suture lines. The outlook is poorest in those cases secondary to carcinoma or tuberculosis for the disease is frequently in the inoperable stage when the diagnosis is first made.

There is such marked disagreement in the literature regarding the expected prognosis that no figures are quoted here other than the results of the 477 cases in which the final outcome could be determined.

In a table similar to that in the article by Parham and Hume the following figures were compiled.

TABLE III—RESULTS OF TREATMENT

	No. of cases	Surgical Per cent	No. of cases	Mortality Per cent
Cured	88	19	51	10
Improved	38	8	19	4
Unimproved	18	4	20	4
Deaths	61	13	176	37

From the figures given in Table III it can be seen that the outlook is anything but favorable in the face of a combined mortality of 50 per cent and a curability rate of less than 30 per cent. This is actually however what should be expected when one recalls that the most prominent etiological factors are those diseases least amenable to cure. The average life expectancy of all types and stages of the disease is about three years.

There has been no remarkable change for the better in the treatment of vesico-intestinal fistula in the past twenty years and there seems no immediate promise of improvement.

#### SUMMARY

Since Praxagoras' description of a case of vesico intestinal fistula in the second century re-

TABLE IV—SUMMARY OF THE 21 CASES OF VESICO-INTESTINAL FISTULA IN THE UNIVERSITY OF CALIFORNIA HOSPITAL

Hospital number	Sex	Age	Etiology	Fistula between bladder and	Treatment	Result
2302	M	63	Diverticulitis	Sigmoid	Excision of fistula with enteroplasty and cystoplasty	Dead 5 weeks later
57840	F	50	Carcinoma of sigmoid	Sigmoid	Fekete procedure—excision of tumor	Improved
40304	F	28	Following salpingo-oophorectomy for tuberculosis	Rectum and skin	Conservative—irrigations etc.	Cured
77335	M	62	Traumatic catheterization*	Transverse colon	Transurethral resection for prostatic hyperplasia	Cured
5949	M	67	Radical penile proctectomy	Rectum	Cystostomy and Young Stone rectovesical repair	Cured
44479	F	62	Radium burn in treatment of cancer of bladder	Rectum	Continuation of cystostomy	Unimproved
70313	F	49	Following myomectomy	Descending colon	None	Unimproved
75417	M	34	Tuberculosis of lung and bowel	Rectum	None	Unimproved
15022	M	31	? Trauma	Rectum	Note: Patient had physiological severance of cord at L <sub>3</sub>	Unimproved
573	M	15	Traumatic catheterization*	Rectum	None	Unimproved
73746	M	8	Postoperative rectal fistula with subsequent abscess	Rectum and urethra	Cystostomy and perineal fistula repair	Unimproved
72293	M	54	? Trauma	Rectum	None. Patient was psychotic	Unimproved
7416	M	66	Radium following proctectomy for cancer	Rectum	None	Dead
7485	M	63	Radium following partial cystectomy for cancer	Rectum and ileum	None	Dead
14409	M	63	Radium for cancer of bladder	Rectum	None	Dead
17870	M	56	Cancer of bladder	Rectum	Cystostomy and radium	Unimproved
19352	M	50	Cancer of bladder	Rectum	Conservative—medical	Unimproved
11790	M	35	? Tuberculosis. Unincultured positive	Pectum	None	Unimproved
91246	F	22	? Appendiceal abscess	Ileum	Resection with end-to-end anastomosis	Cured
3833	M	54	Following abdominal operation thirty three years before	Rectum	Medical	Unimproved
81107	M	53	Cancer of rectum	Rectum	Colostomy	Unimproved

\*Not done in the hospital.

ports of over 600 cases have appeared in the literature. The incidence is 3 in males to 1 in females and the average age of the patients is fifty one years. Diverticulitis is the most frequent etiological agent and, with the addition of tuberculosis and carcinoma, accounts for about 50 per cent of the cases.

The enterovesical communication is most common between the bladder and the rectum, is of the direct variety when secondary to carcinoma or tuberculosis, and of the indirect variety when secondary to an abscess associated with diverticulitis. The vesical opening is located most commonly in the region of the trigone, more often on the left side.

The cardinal symptoms are pneumaturia, fecaluria, and the passage of urine by rectum.

These are associated with the symptoms of cystitis and those of the intrinsic lesion causing the fistula. The complications of seminal vesiculitis, epididymitis, fecal vesical calculus, and ascending pyelonephritis are relatively infrequent.

The diagnosis of vesico-intestinal fistula is facilitated by the appropriate use of cystoscopy, cystograms, sigmoidoscopy, barium enemas, and methylene blue by rectum.

Treatment may be palliative, either medical or surgical, or curative. To achieve a cure, primary closure with excision of the fistula may be the method of choice, or resection of the lesion of the bowel, with or without preliminary colostomy, may be used.

The prognosis, only fair at best, is most favorable in the traumatic variety of fistula, less

favorable in the inflammatory group and least favorable in carcinoma or tuberculosis

### CONCLUSIONS

1 Vesico intestinal fistulas occur with sufficient frequency to require on the part of the practicing urologist a thorough knowledge of the syndrome and diagnostic procedures indicated

2 Treatment is fundamentally surgical, whether it be palliative in nature or curative

3 The average life expectancy of all types is about three years

4 The mortality is greatest in cases with fistulas caused by carcinoma or tuberculosis some what less for those with fistulas caused by inflammatory processes and least for those with traumatic fistulas

5 No improvement in curability is demonstrable in the past two decades

I wish to thank Dr Frank Hinman Clinical Professor of Urology for his interest and help in writing this review

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# GENITO-URINARY SURGERY

## ADRENAL, KIDNEY AND URETER

Surraco L A. Pyelographic Diagnosis and Treatment of Polycystic Kidney (Diagnóstico pielográfico y terapéutica del riñón poliquístico) *Memoria Soc. uruguaya de urol.* 1937-38 3-4 7

Surraco states that the pyelographic study of polycystic disease of the kidney reveals the presence of common signs which establish the diagnosis in some cases and suggest it in others. Interpretation of the pyelogram requires an analysis of the aspect of the image as a whole and of the aspect and the relations of its different elements to the renal contour, to the renal pelvis, and to the primary and secondary calyces.

The aspect of the image as a whole shows the bilateralism of the changes in the pyelogram, the salient characteristics of which are total, regular, and harmonious enlargement with relative narrowing, these factors are variable in each case. The individual and collective aspect of the pyelograms of different patients presents a surprising complexity which defies the most astute comparisons. The pyelogram of each case shows an individual arrangement that recurs over its entire extent and in both kidneys.

In the simple roentgenogram, the renal contour is enlarged especially in length, and keeps its regular form or presents an undulating aspect because of superficial cysts. Bilateralism of this condition constitutes a diagnostic sign of probability and even certainty of polycystic disease while unilateralism has no diagnostic value by itself. Pyelography confirms the diagnosis. The pelvis shows itself generally to be small with early division into primary calyces, lengthened, narrowed and with clearly marked contours. The calyces are long narrowed at their isthmus and shaped like an hourglass, with regular and clearly marked contours of the isthmus and have an apex opening into multiple goblets with well delimited contours. The disposition of the primary calyces is important generally, the upper and the lower ones form a straight line. The author attaches special diagnostic significance to the presence of multiplicity of the goblets of the apex and to the presence of his own three signs, which are curvatures or crescents on the primary calyces and the goblets of the apex, encasements, and sprays (rosettes), the latter two may both recur in two or three superimposed series, in which case the sign of the spray makes the diagnosis certain. When most of these signs are found, as in the 18 cases which the author reports, the diagnosis is established, when only a few isolated signs are present, as in 4 of his cases the diagnosis is doubtful and the possibility of neoplasm must be considered, unilateralism, segmental changes the absence of a regular contour of the pelvis and calyces and goblets of the apex which

seem to be blurred or cloudy militate against polycystic disease.

The treatment of polycystic kidney is subordinated to the anatomical and clinical concept of the disease which is characterized by an anatomical syndrome (bilateralism) and a clinical syndrome (progressive renal insufficiency). The bilateralism is present in all cases and the progressive renal insufficiency is caused by the destruction of the parenchyma through the development of the cysts, and possibly by the toxic action of the contents of the cysts on the organism. The disease is usually discovered between the ages of twenty five and forty years and the patients finally die from uremia, especially the azotemic type. These facts make it evident that the treatment of choice must be medical and that recourse can be had to surgical intervention only in the case of extreme necessity in the presence of certain complications, even then the intervention must be conservative.

The complications which call for surgery are hypertension pain, hematuria, infection alterations by visceral compression, tuberculosis lithiasis, and spontaneous rupture. Nephrectomy is urgently indicated in mild suppurative and incoercible hemorrhage and is used deliberately in exceptional complications after a comparative functional study of the two kidneys. Pyelotomy is employed in lithiasis, the difficulty of the intervention lies in the fact that the pelvis is small and difficult to expose, and this condition becomes even worse when the calculus is in one of the calyces. Nephrotomy is to be rejected because of its high mortality. Puncture of the cysts is done to relieve pain, its results are negative or doubtful. Decapsulation and excision of the cystic walls is the operation of choice for pain, hematuria, suppuration, and the symptoms of nephritis and hypertension associated with fixation it is the best intervention to relieve pain from any cause. Nephropexy, which the author has used with good results in 12 of his 22 cases, is easily executed by the use of the membranes obtained by decapsulation and extirpation of the external wall of the cysts.

RICHARD KEMEL, M.D.

## BLADDER, URETHRA, AND PENIS

Schaer, W. Experimental Researches on the Powers of Absorption and Excretion of the Mucous Membrane of the Bladder (Experimentelle Untersuchungen ueber das Resorptions und Ausscheidungsvermoegen der Blasenschleimhaut) *Ztschr. f. urol. Chir. u. Gynaek.* 1938 44 183

The conditions of absorption by the bladder are still by no means clearly understood, and of excretion by the bladder we know nothing whatsoever. Numerous publications dealing with the subject are briefly reviewed in this work but in the opinion of

the author not one of them explains the conditions of absorption. Evidence has recently been brought out that absorption of numerous substances may occur without unusual prerequisite conditions.

In the experiments for investigating absorption female dogs were used for the most part and exclusion of the bladder was obtained by the establishment of double ureteral fistulas. The bladder was then emptied by a thin catheter and was irrigated repeatedly to remove the last remains of urine. Various exactly measured quantities of a chosen solution were then instilled into the bladder. The concentration of this solution was quantitatively determined beforehand and the instillate was left in the bladder for different lengths of time. After the fluid had been expelled its ingredients were quantitatively determined and in the case of each ingredient the amount absorbed was found by subtracting the quantity evacuated from the quantity known to have been present in the original solution.

#### ANIMAL EXPERIMENTS

##### *Absorption of substances dissolved through ionic disperse action*

1 Sodium iodide. This is absorbed rapidly and in a large amount. The experiments show clearly that substances pass through the mucous membrane of the bladder not only from hypertonic solutions but also from isotonic and hypotonic solutions. The bladder affected by cystitis possesses a heightened power of absorption.

2 Strychnine in rabbits. The experiments showed permeability for this poison.

##### *Absorption of substances dissolved through molecular disperse action*

1 Sugar. The greater the concentration and the greater the pressure the larger was the amount of sugar absorbed.

2 Urea. The results corresponded to those of Frey and Fender. As compared with solutions obtained through ionic disperse action the amount absorbed is less with urea and dextrose i.e. the smaller the particles before absorption the greater were the quantities of each that were absorbed.

*Absorption of colloidal substances.* Experiments with colloidal dye stuff solutions. Two cubic centimeters of methyl blue or of sulfphenolphthalein were introduced through the aboral ureteral stump into the bladder of a dog with a unilateral ureteral fistula. The urine dripping from the oral stump of the ureter was caught and saved. After from forty five to seventy minutes excretion of the dye was macroscopically evident.

*Absorption of gas forming substances.* In this experiment ethyl chloride was introduced. Increasing drowsiness of the animals was first noticed after the bladder was well filled and distention had taken place. However it was always possible to awaken the animals by mechanical stimulation. The expired air had a definite odor of ethyl chloride. In this connection the author points out the possibility of a vesical basal narcosis.

*Absorption of corpuscular elements.* Particles of India ink penetrated in large numbers into the deeper mucosal and muscular layers the regional lymph glands and the spleen. The liver remained free.

*Resorption of urine.* Urine was instilled into the bladder and left for twenty four hours. It was determined not only that the animal's own urine was resorbed but further that all the substances present in the urine were able to pass through the bladder wall. Resorption was most active in the case of urea.

*Resorption of water.* Water also can be resorbed and the amount resorbed depends on the degree of thirst of the animal.

*Route of absorption by the vesical mucous membrane.* To a considerable extent absorption takes place by way of the lymphatics not only in the case of the corpuscular elements but also in that of substances in solution. Experiments showed that the addition of adrenaline did not retard absorption. This may be explained on the ground that adrenaline which contracts the blood vessel also dilates the lymph spaces.

#### EXPERIMENTS ON HUMAN BEINGS

The bladder was emptied with a catheter and then a known quantity of the solution to be tested was introduced into the bladder and after a certain time during which it became mixed with the freshly entering urine it was evacuated and tested. The tests showed that (a) sodium iodide was absorbable (b) from 7 to 25 per cent of a 4 per cent solution of indigo carmine was absorbed and (c) from 14 to 32.7 per cent of perruine was absorbed.

All these experiments showed that the ulcerated bladder is capable of absorbing as much as three times the amount that the normal bladder absorbs. It could be demonstrated that all the laws relating to absorption which are valid for animals are true also for man. Contrary to what appears in numerous reports in the literature it was found that there is absorption not only of hypertonic but also of hypotonic solutions as already stated and not only in the case of a diseased bladder as was previously assumed but also in the case of an entirely healthy bladder. Anesthetizing substances are absorbed with especial ease.

As to the capacity of the vesical mucous membrane for excretion it was demonstrated that substances which otherwise are secreted by the kidney with the urine may pass into the bladder directly from the blood. Two experiments to test this possibility were made on human beings with complete anuria.

The capacity of the vesical mucous membrane for absorption and excretion of aromatic compounds was tested with beta naphthylamin which is known to possess strongly cancerogenic properties. The experiments were carried out in the Ciba laboratories.

*Absorption experiments.* The afore mentioned substance was absorbed in various concentrations between 4.8 and 17.9 per cent. When solutions of higher concentration were instilled the animal (rabbits) died with phenomena of poisoning.

**Excretion experiments** In dogs, nephrectomized bilaterally, 10 ccm of a 2 g per cent solution of beta naphthylamin were injected subcutaneously at half hour intervals. Tests of the saline solution used for irrigation of the bladder lining showed the presence of beta naphthylamin after two hours of irrigation. The experiments allow the conclusion that the mucous membrane of the bladder is capable of absorbing beta naphthylamin from the urine when it is present in very small amounts as occurs in aniline workers. The substance is precipitated in the mucous membrane and deposited as small granules around the vessels. It is evident from these experiments that in the choice of substances to be used for irrigation of or instillation into the bladder the following points should be considered: toxicity, absorbability, concentration, bladder capacity and condition of the mucous membrane.

(RINTELEN) FLORENCE A CARPENTER

### GENITAL ORGANS

Geissendoerfer R. The Relation of Follicle Hormone to So Called Prostatic Hypertrophy (Die Beziehungen des Follikelhormons zur sogenannten Prostatahypertrophie) 63 Tag d. deutsch Ges f. Chir. Berlin 1939

There are essentially two conceptions of the influence of internal secretions in the development of prostatic hypertrophy. Both views concede a diminution of the testicular function in advanced age. As a result the adherents of one view believe that there is an increased washing away of the hormone of the anterior pituitary lobe; others maintain that there is a preponderance of follicle hormone which is present also in the male organism. The latter condition is considered by Burrows, Kennaway, Lacassagne, Moszkowicz and others to be the exciting cause of prostatic hypertrophy.

We report the results of our experiments with follicle hormone on mice and rats which for some time received various follicle hormones. The evaluation of these experiments was based upon macroscopic and microscopic study of serial sections of the urogenital organs. First the normal organs of the experimental animals are described particularly the various prostatic lobes. The following effects of the action of follicle hormones in experimental animals were demonstrated: retrogression of development in size and reduction of weight; involution of the testicles; tense distention of the seminal vesicles with many hormone preparations 100 per cent enlargement of the dorsocranial prostatic lobes and sporadically dilatation of the urinary bladder. Microscopically quite typical changes were shown, chiefly the transformation of epithelium in the dorsocranial lobes into many layered squamous epithelium; other changes consisted of cornification, formation of corpora amylicacea and plications, with simultaneous dilatation of the glandular tubes. Interstitial connective tissue was also increased in general, therefore, phenomena of proliferation were found,

while in the other prostatic lobes there was evidence of atrophy.

In a synoptic table the results of the experiments are explained in greater detail. Particularly impressive was the effect of the follicle hormone when administered subcutaneously.

Since in sex hormones we are concerned with active principles which are specific as to sex but not as to species, it is important to make comparisons with the corresponding relations in man. As to prostatic hypertrophy the following parallels are found.

Testicular involution in man appears spontaneously in advanced age in the experimental animal as a result of the action of follicle hormone in old men as a consequence of cessation of the testicular function particularly of the internal secretion of the testicle while the follicle hormone attains preponderance. In animal experimentation this occurs as a result of the artificial administration of a considerable amount of this hormone. In both cases therefore there is a disturbance of the hormone quotient in favor of the feminine hormone.

Both in man and in the experimental animal only the dorsocranial prostatic glands are altered and enlarged at the same time in both the other prostatic glands (in man the so called surgical capsule) undergo atrophy. In both we find dilatation of the gland tubules of the dorsocranial glands also epithelial transformation and formation of corpora amylicacea. Although in man generally there is no transformation into squamous epithelium nevertheless we find such appearances in the fetus and in the newborn at a time when they are subject to the action of folliculin. Thus a whole series of typical and analogous relations with reference to prostatic hypertrophy in man and the experimental animal may be ascertained.

On critical examination of all the theories so far advanced as to the cause of prostatic hypertrophy we must admit that the conception of its development as a result of a disturbance of the equilibrium of the hormone quotient of the sex hormones not only is best substantiated physiologically and by pathologic anatomical findings but at the same time includes also all relevant factors.

(GEISSENDOERFER) J. M. SALMON M.D.

Fischer A. W. Surgery of the Prostate (Zur Chirurgie der Prostata) 63 Tag d. deutsch Ges f. Chir. Berlin 1939

As a thorough understanding of the symptoms presupposes an accurate knowledge of the pathologic anatomical processes present in the prostate the author presents the prevailing relationships of hyperplasia of adenomas by means of serial sections of the prostate at the different ages of life. The urethral walls are pressed together by the pressure of the adenoma and the bladder musculature must first overcome this compression before evacuation of the bladder can occur. The hyperplasia of the adenoma must be considered today as of hormonal origin as a result of the lack of male hormone. The

indication for surgery must depend on the function of the kidney during decompression with the catheter. Cases of heart and circulatory insufficiency and with suppurative pyelonephritis and failure of kidney function are primarily hopeless. In these cases a permanent fistula of the bladder helps but little and medication is not of much avail. Immediately with the beginning of treatment with the residual catheter the ducts are severed. In his own material the author has shown that at the conclusion of the observation 70 per cent of the patients had become operable, 12 per cent symptom free from the catheter treatment, although not cured, and 18 per cent were inoperable. One half of the last died at the clinic, 40 per cent of the deaths being due to pyelonephritis and uremia. Ambulant cases are not discussed but there are among them cases of acute retention due to alcoholic overdistention with failure of the bladder musculature. In the literature the mistake of considering acute retention as an expression of a severe clinical picture is often made. The danger is the damage to the kidney. The kidneys are usually in good condition in acute retention but not in chronic disease with gradual increasing retention and back pressure.

The kidney function and relief of the toxemia are the deciding factors. At the present time after years of observation and comparison of clinical signs and chemical values we can arrive at a much better evaluation of these factors and this is great practical progress. It has been shown that the kidney changes in so called prostatic hypertrophy are to a great extent reversible, much more so than the internist will believe on the basis of his clinical material. One must not proceed chemically and consider cases inoperable just because the values for specific gravity are poor. Only the fact that the kidney still protects the individual from uremia is significant. If this can be made possible only at the expense of an increased amount of fluid with low concentration it is sufficient and the patient is operable. Too many patients are considered inoperable. That only 15 per cent are operable as some claim cannot be true. That is proved by statistics which show a cure of five years duration or longer following all operative procedures even in such supposedly inoperable cases. If the kidney is so inefficient that the patient is inoperable he will not live five years anyway.

Considerable attention should be paid to the possibilities of failure following these procedures. In practice the thorough and prolonged preoperative preparation is of deciding significance. The delayed cases will fare better the longer the preparation, the better the local immunization of the bladder and the higher the resistance of the patient. As opposed to the preoperative preparation and decompression of the bladder and kidneys the purely technical procedures are less important. To me personally the suprapubic route operation in several stages and early getting out of bed on the part of the patient have been most gratifying. Others prefer the perineal route or the operation devised by Voelcker.

In very heavy individuals it is of course easier to operate from the rear. It is impossible to give comparative statistics as the material is not chosen according to the same standards. Embolism also is a too uncertain phenomenon varying too much in time and location to be of much significance in evaluation of a procedure. The procedure of Franc (bursting) gives good results but it is much simpler also to peel out the adenoma after the bursting. The author employed the two stage radical operation in 100 per cent of his cases with 8.6 per cent fatalities, half of which were due to emboli, the others being due to pyelonephritis which was diagnosed erroneously as being an operable condition. Electroresection is a usable procedure but it cannot be considered an ambulatory procedure as so many laymen and some physicians seem to think. The danger of embolism may be less but the danger to life as a result of infection is greater than with the radical operation. The method is not bad but it is not less dangerous than the radical operation and takes almost as long a stay in the hospital.

The theory that all operable cases should be operated upon radically and the inoperable cases should be treated by electrosurgery is not proper. Far too often cases are considered inoperable. If the case is not suited for one procedure it is not suited for the other. The patient whose kidney and circulation are insufficient simply cannot be saved. If a patient is operable one may give him his choice as to treatment but he should be informed that better permanent results follow the radical operation.

The field for electrosurgical resection is the early cases and the isolated enlargements of the middle lobe of the prostate. X-ray treatment may improve the early cases but the results are irregular. The method may be tried in diabetics. Hormone treatment brought no results, it is possible that it induced a generalized stimulation of the body.

All therapeutic methods should be employed only in those cases which have been stabilized by proper preoperative preparation. The residual urine must be constant. Rest in bed and treatment for cystitis alone are powerful healing measures. If one uses hormones and also treats the cystitis no definite evaluation of the hormone treatment can be made. The bars which occur at the entrance of the bladder are suitable for electrosurgery, also the cases of cancer of the prostate in which all chance of doing a radical operation is past. In these cases electrosurgery may act palliatively.

(A. W. FISCHER) LEO A. JÜRKE, MD

#### MISCELLANEOUS

Bravetta G. Pneumopyelography in the Diagnosis of Urinary Calculi (La pneumopyelografia nella calcolosi urinaria). *Arch. ital. di urol.* 1939, 16, 133.

With the development of roentgenography urological diagnosis has made enormous progress, especially in cases of renal calculus. Although simple roentgenography is helpful it does not furnish pre-

cise enough information for a pyelotomy, nephrotomy ureterotomy or nephrrectomy. Additional aids have been intravenous pyelography and retrograde pyelography after ureteral catheterization. These methods are successful in the majority of cases.

However, there are radiotransparent calculi which are not satisfactorily demonstrated by these methods. Bust has arranged a list of calculi according to the increasing opacity of their chemical constituents: acid ammonium urate, uric acid, acid magnesium urate, acid sodium urate, acid calcium urate, ammonium magnesium phosphate, calcium oxalate and calcium carbonate. Also pure cystine and xanthine stones are radiotransparent. Stones of this type may be rendered visible by the injection of a gas about them. The idea is an old one and was tried by Burckard and Poland in 1907. Since then it has been developed by a number of investigators; the author describes the literature in detail. Mention is made of the possibility of gas embolus if air is used or if the intrapelvic pressure is greater than 200 mm. of mercury. The method is useful in the more accurate localization of calculi and their differentiation from fecaliths, biliary calculi, calcifications in the lumbar region, and calcified mesenteric and retroperitoneal glands.

The author uses oxygen in his technique because it is more readily absorbed and there is little danger of gas embolism. Contraindications are (1) uremia, serious and acute, (2) fever and (3) hematuria. No anesthetic is given because the patient's subjective sensations of fullness of the renal pelvis are used to determine when to stop the injection of oxygen. Usually from 7 to 15 c.c.m. are injected through the ureteral catheter by means of a sterile 20 c.c.m. glass syringe.

The author describes briefly 5 clinical cases with accompanying roentgenographic illustrations. All of these cases were treated surgically and the roentgenographic diagnosis was confirmed.

In one of the author's cases a ureteral calculus was demonstrated. Simple x-rays showed a shadow



Fig. 1

which could not be definitely interpreted as urinary in location. Intravenous pyelography demonstrated the pelvis, calyces and ureter clearly, but obscured the stone. Retrograde pyelography with an opaque medium presented the same difficulties. However, an injection of oxygen definitely demonstrated the calculus within the ureter (Fig. 1).

Pneumopyelography in certain instances may give brilliant results. No final judgment should be passed in doubtful cases by any specialist as to the presence of a urinary calculus until this precise method of diagnosis has been used.

The author presents a brief bibliography of the pertinent literature.

JACOB E. KLEIN, M.D.

# SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

## CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Baehl E. Osteitis Tuberculosa Multiplex Cystoides in Youth with Especial Attention to the Positive Tuberculin Reaction and the Blood Picture (Beitrag zur Juenglingschen Osteitis tuberculosa multiplex cystoides mit besonderer Beruecksichtigung der positiven Tuberkulinanergie und des Blutbildes) *Deutsche Ztschr f Chir* 1938 251 340

This disease of bones during youth is recognized from the small cyst formations. In the majority of cases these develop symmetrically in the proximal and middle phalanges of the fingers and toes. A single case is recorded in an eighty five year-old man. This disease which exhibits a self evident secondary form of tuberculosis occurs most often in the third and fourth decade of life.

There is a recognized relationship between this bone disease and two skin diseases namely lupus pernio and Boeck's sarcoid which the author states may be identical. In the described case there was found on the terminal phalanx of the index finger a bluish red swelling painful on pressure which corresponded to the nodular localized form of Boeck's miliarv lupoid. Microscopically there were found epitheloid cells lymphocytes and giant cells. Twelve years earlier the patient had suffered from a disease of the lung associated with fever which had been diagnosed as pneumonia. However from a study of the lung markings on the coentgen film it may be concluded that the disease in question was tuberculous of the lung. The tuberculin reaction in this case was positive and there was a distinct eosinophilia. The lowering of the tuberculin sensitivity and the simultaneous eosinophilia is not a mere accidental coincidence.

(BRUNNER) HAWTHORNE C WALLACE MD

Girardi V. C. Specific Local Serotherapy in Gonococcal Arthritis (La seroterapia especifica local en las artritis gonococcicas) *Rev de ortop y cirug* 1939 8 300

Since 1933 Rizzo and Pierini have been using in Argentina specific local serotherapy in the treatment of gonococcal arthritis. The good results obtained by them encouraged Girardi to employ this method in 1934 with the following technique.

Articular puncture and aspiration of the largest possible quantity of the intra articular contents with immediate injection into the joint of a quantity of anti gonococcal serum amounting to a little less than the extracted fluid.

From 0 to 30 c cm of serum are also injected in the perinarticular tissues sometimes with 1/2 per cent novocaine. The intra articular and extra articular pathways are combined so that the largest possible amount of serum is injected locally.

There may be a local and a general reaction a slight rise of the temperature general depression and immediate increase of the pain. The injections are repeated every twenty four or forty-eight hours. From 5 to 7 injections are necessary.

The first symptom to respond to the injection is the pain. This slowly disappears after a short period of aggravation. After 3 or 4 injections there is also a noticeable diminution of the swelling.

The joint can be mobilized after a few days of treatment then physiotherapy local heat massage and mobilization can be started.

Nine cases of gonococcal arthritis are reported. The ages of the patients were between eighteen and forty six years. Three patients were women and 6 men. In 5 cases the knee was involved in 3 the ankle and in 1 the wrist.

The bacteriological examination of the articular exudate was positive in 4 cases. The number of local injection was 3 in 1 case 4 in 3 cases 5 in 4 cases and 6 in only 1 case.

All of the patients showed spontaneous diminution of the pain after 1 or 2 injections.

All the cases presented hyarthrotic forms of the condition which benefited more than any other from the local serotherapy.

This method can be used also in the early treatment of the phlegmonous form when arthrotomy can be avoided.

The author did not notice any complication. Slight serological reactions disappeared with simple therapeutic measures. It is suggested however that the patients be de-sensitized previously to the injection.

The treatment must be carried out as early as possible.

HECTOR MARINO MD

De Santo D. A. and Wilson P. D. Xanthomatous Tumors of the Joints. *J Bone & Joint Surg* 1939 21 531

Nine new cases of xanthomatous tumors of the joints are presented in detail with accompanying roentgenograms photographs and photomicrographs. There are 32 previously reported cases in the literature. The authors believe that xanthomatous tumors of the joints are more common than the number of reported cases would indicate and that they are frequently treated for long periods under the diagnosis of villous arthritis chronic rheumatoid arthritis loose body joint mouse or torn cartilage. It is even possible for the true nature of the lesion to be overlooked at operation.

There are three types of xanthomatous tumors of the joints solitary multiple and diffuse. The solitary tumors are the most numerous they are almost invariably pedunculated and attached to the synovial membrane they are rounded or spheroidal golden yellow or orange and are studded

with purplish red or black areas representing hemorrhages of varying antiquity. The multiple tumors involve isolated areas of synovial membrane and vary in size and shape. The underlying area of involved synovial membrane has the same orange yellow coloration as the tumors. In the diffuse variety the entire synovial membrane shows yellowish discoloration and is studded with innumerable small and large papillary, polypoid and pedunculated nodules. The intervening synovial membrane resembles that of a hemorrhagic arthritis; it is arranged in exaggerated fern like folds. Xanthomas are found to originate in chronic hemorrhagic villous arthritis.

The pre operative diagnosis of xanthoma of the joints seems never to have been made. Obscure intermittent swelling of the knee joint (36 of the 41 reported cases were in the knee joint) associated with pain free fluid, occasional locking and the presence of a movable tumor usually medial to the patella will frequently be found to be caused by a xanthoma. Aspiration of the joint with the recovery of dark or sanguineous fluid points to the presence of a xanthoma. The demonstration of a large amount of cholesterol in the fluid is probably pathognomonic of xanthoma. The blood cholesterol is frequently elevated. Roentgenographic examination is of value in a negative way because it rules out the presence of a joint mouse and although it will frequently not demonstrate the tumor, it occasionally will reveal the shadow of a soft tissue tumor.

Joint xanthomas can be cured by radical excision. Local excision is sufficient for solitary tumors but in the case of multiple or diffuse xanthomas a subtotal or total synovectomy is usually necessary. Recurrence of the tumor occurred in 7 of the 41 reported cases. Recurrences are probably due to the later development of a small tumor undiscovered at the time of operation or to inadequate removal of the primary tumor. No instance of a benign giant cell xanthoma undergoing malignant transformation has ever been reported. The only difference between a xanthoma and a giant cell tumor of the synovial membrane is the presence of the xanthoma cell, foam cell or lipid cell in the xanthomas.

The relationship between joint xanthomas and other forms of systemic xanthomatosis may be expressed as follows: while many cases of joint xanthomas are associated with hypercholesterolemia no coincidence of joint xanthoma with systemic forms of xanthomatosis exists. Joint xanthomas are related to some fundamental disturbance of the lipid metabolism and possess the 'foam cell' in common with various forms of systemic xanthomatosis. The stroma cell is related to the reticulo endothelial system. It is derived from the surface synovial membrane mesothelium which has reticulo endothelial properties and gives rise to the foam cell, the giant cell and the pigmented cells found in xanthomatous tumors.

ROBERT P. MONTGOMERY, M.D.

# Horwitz M. T. Lesions of the Supraspinatus Tendon and Associated Structures. Investigation of Comparable Lesions in the Hip Joint. *Arch Surg* 1939, 38: 990

Abduction of the arm is accomplished by a complex mechanism, which is studied from the standpoint of the individual muscular components involved. The importance of the action of the supraspinatus muscle in furnishing a fulcrum for the humeral head in the glenoid cavity for the action of the deltoid muscle has been stressed by Codman.

The shoulder joints (150) of 75 cadavers were studied for changes about the shoulder joint. In 30 specimens variable changes in the bursae were noted. There were 10 complete tears of the supraspinatus tendon. In 49 specimens the upper portion of the musculotendinous cuff showed variable amounts of thinning measuring in some instances from only 1 to 2 mm. In 30 cases the superficial surface of the supraspinatus tendon was frayed with separation of the tendon fibers to cause bands or straps. In these cases involvement of the subscapularis was almost as advanced. In 105 specimens there were marked changes in the biceps tendon and bicipital groove with 4 complete tears of the tendon. There were bony changes in all cases, which seemed proportional to the amount of change in the soft tissues.

Since these lesions were demonstrated in the dissecting laboratory on cadavers with histories which contained no hint of injury the author is inclined to take issue with many of Codman's conclusions. Horwitz believes that there is a gradual deterioration of the supraspinatus tendon from excessive use and advancing age and that these changes pave the way for its rupture. Furthermore the studies quoted above show that the changes are not confined to the supraspinatus tendon, but are common

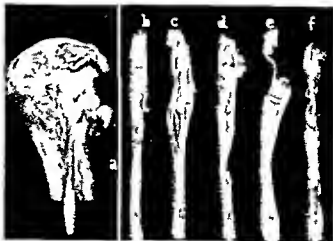


Fig. 1. At a is shown the long bicipital tendon completely severed, the proximal segment having reattached itself to the articular surface and the distal segment to the lesser tubercle. Note the recession of the greater tubercle, marginal proliferation and obliteration of the bicipital groove. The tendons lettered from b to f are long bicipital tendons showing varying stages of flattening, fibrillation, fraying and tearing.

to the musculocutaneous cuff and even to the bone. He believes that rupture of a sound suprapatellar tendon is rare and questions the wisdom of subjecting tissues to surgical procedure when they are the site of degenerative lesions incidental to advancing age, defective circulation and atrophic changes.

HAWTHORNE C WALLACE, M.D.

Hopkins F S and Huston L L. Knee Injuries in Athletics: A Study of End Results. *New England J Med* 1939 221 63.

An analysis was made of 103 cases of knee injuries in athletics in which the end results are known. This group of cases covered a period of thirteen years and is particularly interesting because of the fact that every person included in this report trained to be a physical director and therefore has continued to do strenuous exercise since leaving college.

Football was responsible for 90 (4, per cent) of the knee injuries. Soccer, basketball, gymnasium activities, track, weight baseball, lacrosse and various other sports were responsible to a lesser degree for the remaining cases.

The minor cases of cartilage injury were treated by the use of crutches, Ace bandage and physical therapy. The more severe cartilage injuries were immobilized in a plaster cast while in those cases which did not respond to conservative treatment the cartilage was excised.

There were 19 patients with uncomplicated traumatic synovitis with effusion. Ten of the 10 were on crutches for an average of six and one half days. The time lost from physical practice averaged thirteen days. The time required for complete recovery averaged four weeks. This analysis suggests that approximately 60 per cent of the results following simple synovitis with effusion are very satisfactory.

Of 39 cases of pain of the lateral ligament, 34 pre-existed involvement of the internal lateral ligament and 5 of the external lateral ligament. Treatment was given by means of physical therapy, Ace bandage and crutches. Thirty-two patients were on crutches for an average of eight days. The time lost from physical practice averaged three weeks and the time required for complete recovery averaged twenty-seven weeks. Eighty-two per cent of the cases showed a good end result.

There were 40 patients with injury of a semilunar cartilage treated without immobilization. In 37 the medial meniscus was involved and in 3 the lateral meniscus. They were all treated without immobilization; the treatment was essentially rest, support and physical therapy. Thirty patients used crutches for an average of fifteen days. The time lost from physical practice averaged five weeks. The time needed for complete recovery averaged seven months. Nineteen patients continued to have symptoms and were rated as not completely cured. In 13 patients originally treated as belonging to this group the cartilage was later excised and 3 were found to have crucial ligament tears.

There were 22 patients with questionable injury of the semilunar cartilage. Treatment consisted particularly of rest, support and physical therapy. Sixteen were on crutches for an average of twelve days. The time lost from physical practice averaged five weeks. Thirteen patients required an average of six months to recover completely from the injury. Seventy-eight per cent of the patients in this group had a good end result.

There were 24 patients with injury of the semilunar cartilage who were treated by immobilization. The medial cartilage was involved in 21 and the lateral cartilage in 3. Nine of them showed a marked effusion. A cast was worn for an average of four weeks. Crutches were used for an average of four weeks. The time lost from physical practice averaged eight weeks. Forty-six patients in this group showed a good end result. Fifteen patients averaged five months for complete recovery.

The end results in all probable injuries of the semilunar cartilages (110) which were treated conservatively were good in 43, per cent of the cases.

There were 29 cases of injury of the semilunar cartilage which were treated by operation and the interval from the first injury to the operation averaged nineteen months. In 23 of the cases the operative findings were known. Of these 15 showed a fracture of the semilunar cartilage. Synovial fringes, fat tabs or synovial villi were present in 13 cases. The crucial ligaments were torn in 4 cases. In 8 cases both cartilage were removed at the same operation. In 66 per cent a good result was obtained. The time from operation to walking without aid averaged four weeks. The loss of time from physical practice averaged five months.

Eighty-nine per cent of the cases of simple synovitis and 81 per cent of the cases of pain of a lateral ligament showed good final results. Forty-one per cent of the good results were obtained by immobilization of the injured semilunar cartilage. Thirty-six per cent of the good results followed treatment by means of bandaging, rest, crutches and physical therapy. Sixty-one per cent of the cases with disabling symptoms showed a good end result.

RICHARD J BENNETT, JR., M.D.

## SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Haggart G E and Tounney J W. Knee-Joint Arthroscopy for Removal of a Semilunar Cartilage: Technique of the Lateral and Anterior Incisions. *Surg Clin North Am* 1939 19 29.

The authors limit this description to operations for removal of the internal semilunar cartilage but the same types of incision on the external aspect of the knee can be used for removal of the external meniscus.

Two types of incisions are described, for although the anterior incision is the more commonly employed route, clinical history and subsequent examination may indicate injury to the posterior part



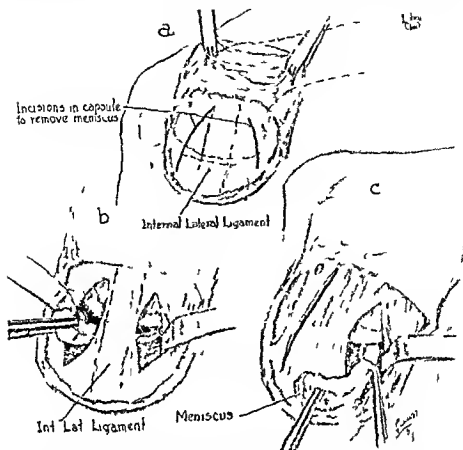


Fig 1 The lateral incision (Timbrell Fisher) The internal lateral ligament is preserved while the entire semilunar cartilage is removed

of the cartilage, in which event the incision on the medial lateral aspect of the knee facilitates removal of the entire meniscus

With the patient anesthetized, an Esmarch bandage is snugly wrapped around the 70-degree elevated extremity from toes to thigh and the tourniquet is then applied. This plan has been found to prevent postoperative nerve or circulatory complications and the operative field is absolutely dry.

A vertical anteromedial incision, about 4 in. in length, is placed approximately midway between the medial border of the patella and the mediolateral ligament. The skin and subcutaneous tissue, and the capsule are divided as separate layers. The synovial membrane is grasped with forceps and incised and the incision is lengthened with scissors. After the fat pad is retracted forward the anterior attachment of the meniscus is easily seen and can be divided and grasped with a heavy clamp. The anterior portion of the meniscus is then freed from the synovial membrane. A special knife that may be bent to conform to the contour of the femoral condyle is used to free the posterior part of the meniscus. A small metal sucker, insulated with rubber except at the very tip, is used to remove excess fluid and to apply a coagulating current to otherwise inaccessible points within the joint.

With the exposure this incision affords most of the cartilaginous surfaces, within the joint and the external meniscus may be inspected. The wound is then closed in layers with interrupted sutures. Fine chromic catgut is used for the synovia, silk for the capsule, plain catgut for the subcutaneous tissue, and silk for the skin. A pressure dressing is applied and the tourniquet is removed. No plints are used and active and passive movements are started within a period of forty eight hours following the operation.

The mediolateral incision is particularly helpful when it is considered essential to remove the entire cartilage because of damage to the posterior portion of the meniscus, but exploration of the joint, particularly of the anterior compartment is rather limited.

The skin and subcutaneous fascia are reflected as one flap and lifted proximally, this exposes the capsule (Fig 1 a). The knee joint is exposed through two incisions as shown in the illustration. The internolateral ligament is preserved, the medioanterior and posterior compartments may be completely explored, and the entire semilunar cartilage can be easily removed. Closure and postoperative treatment are the same as described.

HOMER C. PHEASANT, M.D.

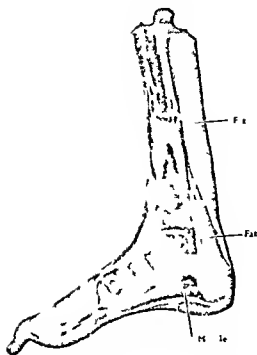


Fig 1 Photograph of section showing necrosis of the muscles of the leg

Smith N R. Massive Necrosis of the Muscles of the Leg After Operation for Removal of a Bone Graft From the Tibia. *Brit J Surg* 1939 26 780

The author presents a case report in which there occurred massive necrosis of all the muscles in the leg except for a small amount of muscle on the sole of the foot following an operation for removal of a bone graft from the tibia. There was no cutaneous gangrene excluding that at the margins of the wound and no local infective inflammation neither was there any general disturbance in the health of the patient. The cause for the necrosis is not known and the case is presented as a warning of a possible result when a tibial graft is removed with the knee held acutely flexed. The author is not aware of any similar case being reported.

The case is presented in detail with a pathological report of the amputated leg and a discussion of the possible causes of the necrosis.

ROBERT P. MONTGOMERY MD

## FRACTURES AND DISLOCATIONS

Gruca A. Intra Articular Fractures (Intraartikulaäre Frakturen). *Chir nar rucka* 1938 11 95

Intra articular fractures have their special mechanism also different biological healing conditions different prognoses and different results from shaft fractures. The direct and indirect mechanism of fractures of the shaft is well known. In intra

articular fractures the anatomical structure of the epiphyses and joint ends plays an important rôle. It is different in adults from that in the aged and in young individuals. Intra articular fractures may be classified as follows:

1 Fracture by compression. The shaft is forced longitudinally on to the epiphysis. A transverse fracture occurs first and later the joint end is driven apart.

2 Fracture by shearing off. The line of force in the shaft does not go directly to the axis but somewhat on a slant (condyle fracture of the femur).

3 Fracture by flexion with simultaneous rapid muscular contraction (transverse fracture of the patella or olecranon).

4 Fracture resulting from the tearing off of a piece of bone by a muscle (tearing off of the tuberosity of the tibia or of the tuberculum majus of the humerus).

5 Fracture caused by torsion.

The joint cartilage is either compressed or torn off of its bed and suffers nutritional disturbances even to necrosis. Fractures or fissures of the cartilage do not heal even after years. Necroses of the cartilage cause joint mice and interfere with function. Nutritional disturbances of the cartilage are clinically less distinct. The joint capsule in intra articular fractures frequently is torn its attachment to the bone is loosened torn or compressed or its nourishment is interrupted. Intra articular hemorrhage thickening of the bone at the site of attachment and capsular thickening all of which interfere with function of the joint may occur. The ligamentous apparatus in general has good resistance. The sites of insertion are much less resistant. Tears of the ligaments play an important rôle in the reposition of the fragments. As the ligaments contain the innervation one sees considerable shock at the moment of injury and later vaso motor disturbances of the joint (long lasting effusions, periarthritic edema or bone atrophy and finally changes in the synovial fluid). The accident itself does not influence the synovial fluid either in its chemical, cytological or biochemical composition. The callus formation according to Bier is influenced unfavorably by synovial exudation. The epiphyseal cartilage is either compressed or torn off. If the reduction is good the cartilage does not lose its ability to produce bone. Interference with growth is rare. If reduction is not effected properly according to anatomico-physiological rules then irregular bone deposits will occur.

The periosteum must be considered in intra articular fractures from three viewpoints: biological, mechanical and as a positive or negative healing factor. If a joint fragment is torn from the shaft then the periosteum is frequently the only source of nourishment for that fragment. According to Moore the partially retained periosteum is an important factor for the maintenance of the reposition. The interposition of periosteal flaps between the fragments may prevent the reposition as well.

as the healing. For a better understanding of the abnormal healing conditions of intra articular fractures we should consult the work of Roux, Martin Mueller, Walter and Willich.

The author differentiates five types of intra articular fractures (1) fissures, (2) tearing off of condyles (3) monocondylar fractures (4) bicondylar fractures, and (5) epiphyseal lysis partial or complete. The complications are early or late nerve injuries and trophoneurotic injuries such as osteoporosis, hard traumatic edema and ischemic contractures as well as muscle atrophy. In the treatment of intra articular fractures two important points must be considered: (1) ideal reposition, and (2) operative treatment. Incomplete reposition, which makes but little difference in shaft fractures, can lead to serious disturbance of function. As such reposition is not always possible with conservative treatment, operation must be done frequently. The line of incision should follow the line of fracture, and the fixation of the fragments should be done through the skin.

(GRUCA) LEO A. JUHNEK M.D.

Kreuter, E. Results Obtained with the Nicola Operation in the Common Dislocation of the Shoulder (Ergebnisse der Nicola'schen Operation bei der gewöhnheitsmassigen Schulterverrenkung). *Beitr. klin. Chir.*, 1939, 169, 32.

Puerckhauer in 1919 was the first to utilize the biceps tendon and lead it through the head of the humerus in operations for habitual dislocation of the shoulder. Independently of Kreuter, Heymanowitch and Nicola employed the same procedure later. Nicola, whose name has been given to the operation, reported 42 of his own cases operated upon in this manner with only 3 recurrences.

The author makes his approach by splitting the deltoid muscle longitudinally a few centimeters

from its anterior border. After inward rotation of the arm the exposed tendon of the long head of the biceps muscle is pulled out of the wound by a double hook. The capsule of the joint is split longitudinally. A hole is drilled through the humeral head parallel with the sulcus intertubercularis. The biceps tendon is divided as far distally as possible. The proximal end is threaded through the head and resutured. The joint capsule openings are then closed. The arm is placed in a splint for fourteen days, after which careful movements are instituted. The patient is usually discharged in a period of about four weeks.

The author had 3 recurrences in 16 cases operated upon by this method. Several of the patients returned to strenuous labor and some even became expert in athletics.

(KREUTER) LEO A. JUHNEK M.D.

Rush, L. V. and Rush, H. L. A Technique for Longitudinal Pin Fixation of Certain Fractures of the Ulna and of the Femur. *J. Bone & Joint Surg.*, 1939, 21, 619.

The authors describe an ingenious method of internal fixation which is recommended for certain comminuted fractures of the upper end of the ulna and also for displaced fractures of the femur in the upper third and in subtrochanteric regions as well as for certain intertrochanteric fractures. A modified Steinman pin is used. In the ulna the pin is introduced axially into the olecranon, and is directed across the fracture site into the marrow cavity of the distal fragment. No immobilization is employed. In the femur, the authors introduce the pin through the greater trochanter in the axial direction into the medullary canal of the shaft. Loose fragments are held by wire.

DANIEL H. LEVINTHAL M.D.

# SURGERY OF THE BLOOD AND LYMPH SYSTEMS

## BLOOD VESSELS

Edwards E A Chronic Organic Arterial Disease  
*New England J Med* 1939 221 251

When the arterial supply to a limb is diminished certain symptoms and disability follow. These vary more with the rapidity and degree of the diminution of the blood flow than with the nature of the disease responsible for the obstruction. Since these effects are so profound it is of consequence to focus considerable attention on the resultant syndrome of arterial insufficiency as well as on the specific background disease.

The author presents a summary of present day concepts of arterial insufficiency and of the most common background diseases. Localized or acute disorders such as aneurysm, embolism or trauma to arteries and functional disorders such as Raynaud's disease are not considered in his discussion. Most of the cases of chronic organic occlusion of the peripheral arteries is caused either by arteriosclerosis or by thromboangitis obliterans. The former is a metabolic disorder occurring in men and women of middle age. In diabetes the disease may occur in relatively young patients. Thromboangitis obliterans or Buerger's disease occurs almost without exception in young men in the latter part of the second or in the third or fourth decade. The patients are usually heavy tobacco smokers. The disorder is inflammatory and involves both veins and arteries. Involvement of the superficial veins in a migrating phlebitis may call early attention to the disease.

Obstruction of the major arteries by any disease diverts the arterial flow through smaller collateral channels. This results in a diminished blood flow or arterial insufficiency with symptoms which are independent of the background disease producing the obstruction. The symptoms and signs of arterial insufficiency may be conveniently considered under the following headings: (1) weak muscle action and intermittent claudication; (2) abnormally cold limbs; (3) hypesthesia, hyperesthesia and spontaneous pain from ischemic neuritis; (4) diminished resistance to injury and ulceration from trivial trauma; (5) blanching of the toes and feet on elevation and rubor on dependency; and (6) faint or absent pulsation in the affected arteries.

The specific treatment of arteriosclerosis consists of the avoidance of mental and physical stress, the cessation or diminution of tobacco smoking and moderation in the intake of cholesterol rich foods. In Buerger's disease it is essential that the patient use no tobacco whatsoever.

The treatment of arterial insufficiency may be divided into the general care of the feet, the avoidance of tobacco and the increase of the collateral blood flow. In the winter's experience, this increase of the collateral blood flow is best accomplished by the use of alternating suction and pressure. Such treatment is contraindicated in the presence of infection or thrombosis. Under these conditions or when the apparatus is not available Buerger's exercises should be used.

Attention should be paid to the general management of these patients. Optimum general health should be maintained and the patient should be encouraged in his fight against pain and disability. In the acute stages of pre-gangrene, ulceration or gangrene the patient should be in bed in a hospital. The procedures previously described are used with the addition of certain measures to diminish pain and to prevent infection. HERBERT F THURSTON MD

## BLOOD TRANSFUSION

Forsell J Morphological Changes in the Bone Marrow and Blood in Acute Hemorrhagic Anemia (Morphologische Veränderungen im Knochenmark und Blut bei akuten Blutungsanämie) *Acta med Scand* 1939 Supp. 101

Forsell has made use of many of the newer hematological techniques in this extensive study of acute hemorrhagic anemia. In normal individuals the bone marrow obtained by sternal puncture contained about four times as many reticulocytes per cent as the peripheral blood. There was also a greater proportion of young reticulocytes in the bone marrow than in the peripheral blood. Shortly after an acute hemorrhage an increase in the reticulocytes (especially the early forms) appeared

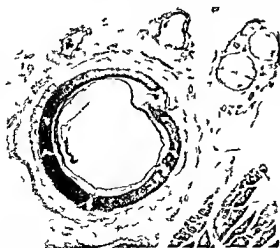


Fig 1 Moenckeberg's sclerosis in an anterior tibial artery. The media is transformed into a calcified tube which has fractured on sectioning. The lumen is unobstructed. The veins and nerve trunks are normal.

in the bone marrow and blood. Very large hemorrhages seemed to produce anisocytosis and a decrease in the diameter of the red cells, but no appreciable change in the volume. With severe anemia, a decrease in the color and saturation index may occur. In a few cases, the ratio of erythroblasts and erythroblasts in mitosis to leucocytes in the bone marrow was increased. There was at times a temporary increase and a shift to the left of the granulocytes of the bone marrow and blood.

During the first or second week after acute hemorrhage, the majority of the cases did not show good regeneration of erythrocytes. The peak of the reticulocyte rise usually occurred on the fifth to the eighth day after hemorrhage ceased. Following this spontaneous regeneration, the mean diameter of the red cells and the saturation index were low in most of the cases. In several patients the color and volume indexes were normal. The erythroblast myeloid ratio in the bone marrow was increased in almost all of the cases.

In some cases of hemorrhage after spontaneous regeneration had subsided, injections of liver extract caused a slight increase in the reticulocytes and erythrocytes. At the end of the period of observation, the patients showed lowered values in the mean red cell diameter and in the color volume, and saturation indexes. It was felt that the liver tended

to reduce the degree of anisocytosis. Liver injections did not cause stimulation of the erythroblasts in the bone marrow.

Arsenic medication in acute hemorrhage following spontaneous regeneration caused a slight rise in the reticulocytes but did not affect the erythrocyte count. Arsenic had no effect on the size and hemoglobin content of the erythrocytes, it did, however, seem to increase the degree of anisocytosis. Erythroblastic hyperplasia was noted in the bone marrow in these cases.

Iron medication in posthemorrhagic anemia distinctly hastened the rate of blood regeneration. This was revealed by the marked increase in reticulocytes in the bone marrow and peripheral blood. During iron medication there was an increase in the mean red cell diameter and in the color volume, and saturation indexes. The bone marrow showed an erythroblastic hyperplasia and a considerable number of erythroblasts in mitosis.

The changes that occur in the bone marrow and blood following iron therapy for hemorrhagic anemia seem to resemble somewhat the findings in pernicious anemia. The occurrence of nucleated red cells in the blood in acute hemorrhagic anemia is closer related to the degree of anemia and extent of blood loss than to the intensity of blood regeneration.

HOWARD L. ALT, M.D.

# SURGICAL TECHNIQUE

## OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Woitman H W Postoperative Neurological Complications *Surg Clin North Am* 1939 19 955

The author remarks that perhaps the simplest and most readily understood of complications results from the injury of nerves. It is not beside the point to call attention to a few things so obvious that they may be overlooked namely that the limbs of the relaxed and uncooperative patient provide secure and convenient handles for pulling him about while dressings are being applied that prolonged and heavy sedation not only relieves the pain of a wound but also relieves the discomfort incidental to the patient's remaining in one position a long time that the patient after he is in his room is either lying or sitting and finally that neuritis of isolated nerves usually is caused either by compression or by traction.

After the patient has regained consciousness he may become aware of numbness and perhaps also of weakness of the little finger and the adjacent part of the hand or he may find that extension of the fingers and wrist is impossible. Because of the exercise of greater care in securing the arms and providing substantial pads injury to the ulnar and radial nerves from the edge of the operating table has become almost a thing of the past.

Ulnar neuritis in one or both arms also may appear gradually during convalescence. It generally occurs among patients who have lost considerable weight. In some cases it is due to impingement of the ulnar nerve on the bed particularly when the patient lies for long periods on his back and the bed is hard in other cases it appears when the patient rests his arms on the unupholstered arms of a chair.

The homologue in the lower limbs is evinced by foot drop and occasional numbness of the dorsum of the foot. Palsy of the peroneal nerve may be caused by pressure of poorly designed or inadequately padded rests used to hold the legs in the lithotomy position. It also may develop gradually after operation. In such cases pressure on the underlying mattress and traction incidental to hyperextension of the knees on a sagging mattress are responsible. Corresponding to armchair ulnar neuritis is crossed leg peroneal neuritis. Almost always when a patient with such a condition is interviewed he is seated with the palsied leg crossed over the well leg. The anterior crural nerve is seldom injured but injury of this nerve may occur after excessive external rotation of the thigh in the lithotomy position and during operations for femoral hernia. Physiotherapy splints when indicated and time suffice to bring about recovery in most cases. When injury to a nerve is so severe that regeneration is necessary a helpful rule in estimating the time

that recovery will require is to allow one day for each millimeter of growth needed.

The brachial plexus may be injured easily. In reviewing such cases the author takes cognizance of three observations: first that injury of the brachial plexus almost always occurs in women whereas most of the aforementioned types of neuritis usually occur in men; second that the operation has usually been on the pelvis and third that the type of palsy present usually reveals involvement of the upper part of the plexus. Traction on the wrists and pressure on inadequately padded shoulder rests while patients are in the Trendelenburg position are often responsible. Radical amputation of the breast and thoracoplasty may require abduction of the arm above the level of the shoulder a position that may cause traction on the plexus or compression of the plexus by the clavicle.

The pressure of retractors during the removal of tumors also may injure nerves. The attempted injection of solutions into the veins at the elbow may injure the median nerve. In the opening of abscesses the long thoracic nerve the spinal accessory nerves and the median or ulnar nerves in the palm are among those most often severed. Poorly fitting or improperly used crutches and casts may cause pressure on the brachial plexus and on the long thoracic nerve of Bell. Volkmann's ischemic paralysis and tourniquet paralysis are much less common than they were. Nerve injuries associated with fractures and their care obstetrical injuries to the nerves of mother or child and serum paralysis may be mentioned. Injury of the twelfth thoracic nerve incidental to operations on the kidneys may result in pain which is suggestive of further trouble in the kidney.

Hysterical paralysis may simulate traumatic neuritis and unless the true cause is discovered early the situation may tax the psychotherapeutic resources of any physician.

The most frequently paralyzed of the cranial nerves is the sixth which supplies the external rectus muscle of the eye. This injury has been mentioned as a rare complication of spinal anesthesia. It usually appears from seven to ten days after operation and is not permanent.

Paralysis of other cranial nerves as well as lesion of the spinal nerves spinal cord and brain and caudal lesions of one kind or another also have been reported following spinal anesthesia. They are not necessarily caused by it.

In operations on the neck the ninth tenth eleventh and twelfth cranial nerves the cervical sympathetic nerves and the brachial plexus may be traumatized. During tonsillectomy and dental operations the twelfth cranial nerve and the third division of the fifth cranial nerve may be injured inadvertently. An alcoholic injection meant for the

trigeminal nerve may paralyze the oculomotor or eighth nerves

The author considers hemiplegia to be a fairly frequent and alarming postoperative complication. Hemiplegia or other signs of vascular occlusion occasionally may be discovered when the patient awakens, but the usual interval between operation and onset of the disability is about seven days. It may occur in children or in old people, but the average age at which the accident occurs is about fifty years. This complication has occurred after operations in all fields of general surgery, and after all types of anesthesia.

Hemiplegia may also be caused by impeded circulation of the veins.

The possibility that fat embolism of the cerebral vessels may cause postoperative hemiplegia is unlikely, since the embolism is more often manifested by increasing somnolence and stupor. The author calls attention to the finding by Kernohan of large amounts of fat in the arteries of the brain after burns of large surfaces, such as occur in scalding with steam.

The question often arises whether hemiplegia is due to metastasis when the operation has been for carcinoma. This is rarely the case in hemiplegia of abrupt onset since metastatic nodules generally produce their symptoms more gradually. When hemiplegia is associated with empyema of the thorax, it may presage the formation of an abscess in the brain.

As a rule, convulsions make their appearance within ten days following operation, and they are not to be taken lightly since they are generally symptoms of some organic cerebral lesion. They may be local or general, tonic or clonic, and they are often followed by paralysis. Spinal puncture is of diagnostic help and it also may have therapeutic value.

Immediately, or several days after operation, a state of generalized lead pipe rigidity may develop in the patient. It is a serious omen, but some patients slip into this state and out of it again and recover. The tendon and pupillary reflexes may be absent or present, there may or may not be tremor, and the patient may be clear, confused, or comatose.

When this condition occurs, the tentative diagnosis of meningitis is often made since the neck is found to be rigid. Continued application of pressure while raising the head of the patient will gradually permit complete flexion of the head on the thorax, which is not true in meningitis. When the head is released, it may sink slowly and one may even encounter some resistance when it is pushed down on the pillow. The limbs also exhibit lead pipe rigidity and, as in the case of the neck, continued pressure during the performance of Kernig's test will enable one to extend the legs completely, the abrupt spasm noted in meningitis on palpation of the hamstring muscles whenever a given angle is reached is missing. The condition has been observed following various types of anesthesia. It also occurs, among other conditions, in some cases of pneumonia,

typhoid fever, and hepatic insufficiency. The generalized rigidity impresses one as being toxic in origin, and may be classified as an extrapyramidal rigidity, presumably owing to a disturbance in function of the basal ganglia.

A somewhat similar condition, but resembling decerebrate rigidity, has been observed after spinal anesthesia in which the usual dose is administered to a patient who has profound anemia. The dose of anesthetic agent given intraspinal should be sharply reduced for anemic patients as Lundy has emphasized, since this complication is extremely grave.

In some cases disturbance in vision, numbness of the hands and feet, paraphasia, ataxia, tremor, and mental aberration develop. The deficiencies constitute one of the most interesting and symptomatically kaleidoscopic groups of cases. They are probably much more common than is generally appreciated.

Among the complications that are most distressing to the relatives and the hospital authorities are the psychoses. Men and women are affected equally, but patients who are somewhat more than forty-five years of age are more prone to become psychotic. The type of operation, if major in scope, makes little difference.

The author notes that in reviewing these cases one soon becomes aware that one is dealing with several types of psychoses. The most common type, which more strictly may be called the 'postoperative psychosis,' usually does not begin immediately after operation, but after an interval of about five days and lasts for about two weeks. The outstanding features are confusion, hallucinations (especially of vision), illusions, and physical unrest. Often there is no known infection or rise in temperature. This is strikingly illustrated by patients who have gone through a postoperative psychosis with little or no elevation of temperature and then have had some severe febrile complication, such as epididymitis or pneumonia, with no return of the psychosis.

Whether the operation or the anesthetic agent contributes chiefly to the development of this psychosis is a question which has been argued about frequently, but it seems significant that when the psychosis is a 'postoperative psychosis' in the restricted sense of the term, the anesthetic has almost always been given by inhalation and usually includes ether.

It seems trite to mention the matter of sedatives, but it is always advisable to review the medication the patient has been receiving. For example, when the dosage of bromides has been heavy, a restless patient may become confused and have hallucinations which in turn may lead to an increase in the dose of sedatives. Ataxia and nystagmus are observed commonly. Postoperative delirium, tremors among alcoholics, was formerly not uncommon.

The psychoses associated with hyperthyroidism have attracted attention for a long time. The author emphasizes that Dunlap and Moersch warned that

thyroidectomy definitely is contraindicated in the course of severe reactions of hyperthyroidism

When an unwanted talkativeness euphoria agitation and alertness are observed in a patient who has a tendency to incorporate in his pell mell conversation the statement that someone in the back of the room has coughed or whispered and who has a history of previous nervous breakdowns with recovery the earmarks of the manic phase of manic depressive psychosis can be recognized. In such a case a psychosis of longer duration is likely and the transference of the patient to a sanitarium after the wound has healed is usually recommended.

One might anticipate that a depression of manic depressive psychosis would be encountered more frequently but the author believes that depressions are more likely to be complicated by operations than operations by depressions. Too often the somatic complaints of a depressed patient get him into surgical difficulties and the surgeon must be ever on the alert to avoid operation on such patients except when delay would be fraught with danger.

Taken altogether the postoperative mental disorders vary in type duration and recoverability. Most of them belong to the restricted group of postoperative psychoses. Next in frequency is the group which may safely be called toxic infective exhaustive psychoses in which the psychoses immediately preceding and following operations usually are included. These in turn are followed by the deficiencies the manic depressive group and finally by the senile schizoid epileptoid mentally unstable and other groups.

Undoubtedly some psychoses may be prevented by attention to adequate diet by putting at rest fears the patient may have regarding his progress and what was found at operation by providing when necessary an attentive discreet and reassuring nurse especially at night by the avoidance so far as possible of irritating noises and exasperating routine and by seeing to it that the patient has adequate rest. These same factors apply to treatment. When the patient is fearful because of hallucinations or delusions or when he is delirious provisions should be made that he may not fall out of bed or escape. Nurses should not leave the room for a moment without being replaced. Sedatives retransmit physiotherapy and hydrotherapy may be helpful. As soon as possible the patient should be taken on short excursions from his room and returned to wider contacts. When feasible he should be taken out of doors.

Lund C C. The Effect of Surgical Operations on the Level of Cevitamic Acid in the Blood Plasma. *New England J Med* 1939 221 123

Determinations made before and after major operations on 43 patients revealed in almost every case a prompt fall of the cevitic acid in the plasma after operation. In a few cases the level began to rise again after four or five days. Studies will be carried on to determine whether the fall observed is

important from the standpoint of healing or recovery. A low plasma Vitamin C value in blood samples drawn in the period immediately after operation may be less significant as an indication of depleted reserves than a low value prior to operation.

WALTER H. NADLER, M.D.

## ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Dieterichs M M. Articular Injuries. *Vestnik khir* 1939 57 557

The frequency of articular trauma ranges from 6.7 to 13.3 per cent of all war injuries according to the statistics of various nations. The appearance of clinical symptoms of infectious inflammatory processes in articulations is retarded to a certain extent by the bactericidal anti-proteolytic antitryptic and other properties of the exudate. During the period of inflammation of the subsynovial tissues a collateral edema develops in the synovial membrane and is accompanied by a transudation into the articular cavity. After the inflammatory process spreads to the synovial membrane the transudate becomes transformed into an exudate and the synovial membrane begins to display its absorptive activity. It is important to know that in spite of its purulent appearance the exudate usually remains sterile the first twenty-four thirty-six or even forty-eight hours. After the exudate becomes septic its resorption leads to microbiotoxic phenomena with typical septicopyemic complications.

In regard to its biological properties the synovial membrane may be compared with the peritoneum. Both are quite successful in the fight against infection provided that the cavity remains closed; otherwise infection may easily occur. It follows that all sources of infection should be removed during the long incubation period and the synovial membrane should be closed without drainage.

Extreme conservatism is indicated if only the capsule and the synovial membrane are injured without any trauma to the bones. The condition of the articulation is tested by repeated exploratory punctures at a distance from the original injury. The results of the bacterioscopic and bacteriological examinations of the aspirated fluid indicate an arthrotomy or a continuation of the conservative treatment.

In the presence of hemarthrosis the introduction of a trocar and aspiration of the blood are recommended by the author because its presence in the articulation more or less interferes with the function of the joint.

If a fresh non-infected wound has not closed spontaneously but is gaping the excision of all traumatized tissues is indicated. The author stresses the importance of a frequent change of the instruments. The articulation is irrigated with a 3 per cent phenol or a 2:1:1000 rivanol solution or a so-called Chlumsky's mixture consisting of phenol camphor



and alcohol. From 5 to 25 cm. of the fluid used for irrigation are left in the articular cavity and the wound is closed after the introduction of a glass drain. Under favorable conditions a complete closure may be recommended. Only in the presence of streptococci is the wound left open, and Carrel's irrigation method is then employed.

If in a fresh, non infected articular wound small fragments of bone are found, they are removed and the capsule is closed. If a relatively large cavity remains after the removal of the fragments it is filled with some organic, inorganic or biological substance, such as portions of muscles, and the articulation is closed. If however, the fragments are so large that their removal would interfere with the static and dynamic conditions of the articulation, primary resection of the involved joint is indicated. It should be remembered that an atypical resection of a weight bearing articulation frequently fails to produce the necessary coaptation of the articular surfaces, because it does not allow the development of sufficient adhesions to form an ankylosis. Therefore a typical resection is usually indicated in such cases. On the other hand, even a partial mobility of the articulations is useful in the upper extremities.

If on account of the lack of time or unfavorable conditions a dependable asepsis cannot be expected it is preferable to fill the articulation with iodoform gauze and to suture the capsule partially. If after four or five days no septic condition has developed a secondary complete closure is advisable.

It should be remembered that a secondary infection develops as a rule in exposed articulations with a prolonged drainage. Therefore, a complete closure should be attempted at the first opportunity.

If the trauma of the bones is extensive or the general condition of the patient is poor, and large blood vessels and nerves are injured, an amputation or resection must be considered.

Any attempts by unskilled surgeons to remove foreign bodies under unfavorable conditions lead to deplorable results. A bullet located in the cancellous bone of the epiphysis without a fissure is less harmful than a foreign body located in the articular cavity. An attempt to remove such a foreign body should be made only if the patient is seen not later than from twenty four to forty eight hours after the injury, and if sufficient time for the operation and perfect aseptic conditions are available.

Disregarding the type of surgical procedure employed, a traumatized articulation should be immobilized in a plaster of Paris cast or on a splint.

As to the treatment of infected wounds, watchful waiting is indicated. Amputation must be considered if a septic arthritis or an anaerobic infection of the articulation develops, because even extensive incisions are frequently followed by failure. A purulent arthritis in the form of an empyema of the articulation or a capsular phlegmon calls for arthrotomy followed by drainage and partial closure of the capsule. The glass drain should be removed after twenty four hours if possible.

Early active and passive movements contribute to the restitution of the articular function after conservative surgical measures.

JOSEPH K. NARAT, M.D.

Loehr W. and Zacher, K. A Contribution to the Clinical and the Pathological Aspects of Second and Third Degree Burns, Including a Review of the Tannin Treatment (Zur Klinik und Pathologie von Verbrennungen 2 und 3 Grades zugleich eine Kritik der Tanninbehandlung) *Zentralbl. f. Chir.* 1939 p. 5

This report is mainly a comparison of cod liver oil ointment and the Davidson tannin treatments of burns. It is remarkable that, according to reports in the literature, the latter treatment is not standardized. The tannin concentrations vary between 2.5 and 40 per cent. Often other remedies such as trypanavin and acriflavin are added to this treatment. Further difficulties in the proper estimation of results are due to the fact that the statistics studied do not always distinguish between the three degrees of burns. No doubt Loehr's 1,843 cases of burns, abrasions, injuries from high tension currents, and burns resulting from nitrous gases are to date the largest number ever treated with one and the same medicament mymentolan.

According to statistics tannin therapy has definitely reduced the mortality between 10 and 20 per cent. However Wollesen claims that there still is a mortality of 9.5 per cent. Loehr in his 438 reported cases of second and third degree burns (considering this series only) reports only 25 deaths (4.8 per cent). These included all unclassified deaths, also those of patients brought to the hospital late and those in a dying condition. It is a well established fact that most of the early deaths following burns occur within a period of forty eight hours. Of Loehr's 21 deaths 11 belonged to this type. It is interesting to note that tannin therapy did not decrease the number of early deaths. The deaths occurred during primary or secondary shock within forty eight hours, and he accurately defined the causes. He cited especially the different toxins which were found to date following burns: cyanic solution, pyridin bases, and methylguanidin.

According to H. Pfeiffer's researches there is an explosion like surfeiting of the blood with peptolytic ferments, which cause severe damage by their catalytic actions. This theory seems especially valuable to the author. The treatment with cod liver oil ointment produces the lowest mortality to date and Loehr claims that it heals the greatest defects such as necessitate transplantations or other operative procedures. He believes that his method is simple and safe even in inexperienced hands and that it is applicable in mass emergencies. The absolute painlessness of the after treatment is an additional great advantage, also its applicability to different sites, like the face, which is not true with tannin. Loehr criticizes in detail the therapy employed heretofore and condemns medicaments containing poisons and

those prepared with heavy metals he also condemns the Wismuth burn bandage the Stabl calcium liniment and above all the indifferent salves because the usual colors are not sterile. Cod liver oil has the advantage of being sterile in itself and his investigations proved that bacteria cannot continue to exist in it they are gradually annihilated. The so greatly feared secondary infections following burns are thus prevented. Not one of the late deaths in Loehr's cases was caused by infection.

The supposed advantages of the Davidson tannin therapy are (1) by means of the eschar formation the plasma and the water loss is prevented (2) the burnt tissues are devitalized which prevents the resorption of the toxins of the burns and (3) the secondary infection is prevented.

Objections to the tannin therapy are (1) eschar formation occurs only in colloid fibrous tissue (Fuerst) (2) Seeger insists upon an alkalinization of the tannic acid because acid solutions cause swelling and edema of healthy living tissue (3) eschar formation does not take place early enough (It requires from twenty four to forty eight hours hence the poisoning of the body is not prevented rapidly enough. On this account several authors applied silver nitrate solutions after using the tannin solution in order to hasten escharosis) and (4) when the tannin cicatrix integrates heavy phlegmons form.

Loehr produced second and third degree burns on the skin of pigs necks by applying hot soldering irons for the purpose of establishing the difference between cod liver oil and tannic acid therapy. On the third sixth and ninth days fragments of the burned skin were excised for histological examination. Seven photomicrographs in the original article illustrate the findings. Most remarkable in the tannin treatment is the very minor reaction of tissues not involved in the burns (Stupor). This occurs about the sixth day when the tannin eschar bursts. The burns treated with cod liver oil are about three days in advance of those treated with tannin.

Loehr added a report with illustrations of a suppurative cancer of the lymphatics of the breast. This was treated by thermocautery before a radical operation was done. In this case Loehr caused a deep burn extending into the musculature by applying an electrocautery through a metal placed on the skin at the edge of the cancer. This was done because such a deep burn was not produced in the pigs. These burned human skin fragments were treated by both methods. The tannin was found to be effective only in mortified tissue parts containing colloid fibers. In subcutaneous fatty tissue small bits of tannin crusts floated in superficial parts of the crater only without even a trace of penetration into the deeper lying tissue or influence on the masses of deeper necrotic layers.

As to the end results tannin was not effective in third degree burns. It is effective in first or second degree burns if in addition silver nitrate is used. In this respect it compares very favorably with the

amburne method (paraffin Kautschuk gutta percha) rated so highly in England and France or with minor reservations it is on a par with the silver foil treatment of Lexer as the superficial necrosis is coagulated and the secondary infection is thereby prevented. (FRANZ) MATTHIAS J. SEIFERT M.D.

Kalmanowski S. Experimental Results Regarding the Pathogenesis of Burns (Eingige Ergebnisse ueber die Pathogenese der Verbrennung im Experiment) *Chirurgia* 1938 5 3

The pathogenesis of death due to burns is as yet not clear. The different authors solve the problem regarding death due to burns in various ways. The underlying factors are intoxication concentration of the blood, metabolic changes, and the role of the nervous system.

The presence of an intoxication in burns is accepted as well as denied. To evaluate an intoxication Pfeifer suggested the determination of the anti tryptic index of the blood. The author investigated this index in 8 rabbits and 1 rat with artificially induced burns of like extent. The anti tryptic index remained stationary for twenty four hours or was only moderately elevated it reached a maximum after two or three days and remained elevated for about one month. In 2 rabbits which died within twenty four hours the index was the same as before the burn in the rat which died within two days it was only slightly elevated. The height of the anti tryptic index is not in direct relation to the death caused by a burn. The change of the antitrypsin is not specific for burns and cannot be employed as an indicator for the degree of intoxication due to burns. There is no objective proof of the existence of an intoxication. Blood changes begin immediately even during the process of burning. The high temperature causes destruction of the erythrocytes. After twenty four hours there is no further trace of hemolysis.

Of greater importance is the concentration of the blood. This theory was formerly believed by many later overlooked and now again is presented especially by the Americans as part of the burn pathology. According to Underhill the anhydremia the slowing of the blood stream and the tissue asphyxiation produce shock with lowered blood pressure and toxemia and later death. Clinical observations show elevations of the hemoglobin and of the red cell count in the blood of burn patients. The author made erythrocyte and hemoglobin blood determinations on 11 rabbits with burns. He found a suddenly appearing concentration of the blood lasting twenty four hours which was followed by four days of blood dilution below normal finally the blood returned to normal. The causes of the concentration are the loss of plasma in the region of the burn. Two rabbits died within one hour of the burn both revealed marked retroperitoneal edema and in both cases the spleen was extremely small. Probably the erythrocytes of the spleen depot which is shrunken as a result of the high temperature take part in the concentration of

the blood. Shrinkage of the spleen is also observed in anaphylactic and in peptone shock. The plasma loss of the blood is not specific for burns, it occurs in every artificial or inflammatory stasis. The degree of the concentration of the blood is variable. The greatest increase in the number of red cells was 70.4 per cent, and the greatest increase in dried residue was 15.5 per cent. The importance of the blood concentration in the pathogenesis of burns can probably not be denied, however, it is not the only factor in the death and clinical picture. The rabbit with the greatest concentration of blood remained alive also according to clinical observations. Death occurred in many instances after the concentration of the blood had returned to normal. The mechanism of the anemia immediately following the increase in concentration has also been investigated but very little. It is still not entirely clear. Metabolic changes following burns also, have been investigated but little. The temperature reaction of the different species of animals is also variable. In the small animals a temperature drop can be ascertained nearly always. Dogs react variably. In the adult human being a drop in the temperature does not seem to occur very frequently, it may last only a short time and therefore is not determined. The body temperature will probably drop more readily in animals which with a lowered heat production also have an increased loss of heat, i.e., in smaller animals with their relatively larger body surface. The author investigated the temperature in 12 similarly burned rabbits. In 5 instances the temperature was elevated after five minutes for a short time only and probably because of the warming of the entire body of the animal by the burn. In burns of a smaller area no elevation of temperature set in. A drop in temperature occurred within eight minutes, and the greatest drop occurred within two hours after the burn. The drop in temperature extended to 12.7 degrees. Two animals with a drop of 9.4 degrees and 12.7 degrees respectively succumbed. Others, even with a drop of 9.5 degrees remained alive. The temperature came back to normal in 2 animals after twenty-four hours, in 6 others after three days but in the others it remained low for a longer period.

Gaseous metabolism determinations were made on 12 rats (method of Paschutin) before and after the burns. Each determination lasted two hours. The metabolic rate falls after the burn for four hours, probably also for longer. Oxygen consumption fell on an average of 17.5 per cent. Three rats with a drop in the rate of 39, 35, and 33 per cent respectively, died within twenty-four hours. Two rats died after two and five days respectively. The others remained alive even with a drop in the rate of 33 per cent. In 2 rats there was no change in the rate. Twenty-four hours after the burn the basal rate is normal and then it begins to rise. The decrease in the oxidation processes after the burn is undoubtedly not without significance for the body and can become so precarious that a compensatory

effort will not set in. The temperature drop seems to prove this. It is less a question of increased loss of heat than of diminished production of heat. Warming a burned animal in a controlled thermostat improves the condition, and sometimes saves its life. The human being suffering from a burn and especially children should be kept warm, and this is of paramount importance. After a burn, oxygen consumption becomes less than the elimination of carbon dioxide, therefore the respiratory coefficient drops and does not return to normal for about twenty-four hours. The quantitative decrease in the gaseous metabolism is not so much typical for the action of a burn as the qualitative change. The author concludes from his experiments with burns on starving rats that these changes are present in all disturbances of the carbohydrate metabolism. The carbohydrates apparently are not oxidized completely, the blood sugar is elevated. He believes that there must be some relationship between hyperglycemia and the simultaneous increased adrenal secretion into the blood stream. There are similarities between the changes in the organism following burns and those following traumatic shock. In one experiment of the author's on a rat, in which he produced a fracture of the femur, there was a change in the basal metabolism similar to that following burns. The author believes that the drop in blood pressure after burns is due to the observed vessel collapse. The clinical picture of extensive burns is very similar to that of traumatic shock. Many consider death due to burns as being the result of shock. The author does not wish to deny this in those cases in which death takes place during the actual burning or immediately after, but according to him there are still other factors to be considered such as the influence of the nervous system, the circulatory system, the endocrine system, and the metabolism. He does not concede that a specific intoxication by split protein products has been proved.

(HENSEL) LEO A. JUNKLE, M.D.

#### Amidon E. L. Hematological Studies in Acute Infections. *J. Lab. & Clin. Med.* 1939 24: 1009.

The value of the white and differential counts in acute infections is accepted generally, as is also the shift as determined by Schilling. Valuable informative evidence can also be obtained from the qualitative changes in the neutrophils. The purpose of this work is to determine the relative value of these different methods.

Several methods were employed in examining the same blood and the information thus gained was evaluated and compared. These methods consisted of (1) total white count, (2) differential count, (3) estimation of the percentage of young neutrophils, (4) estimation of the percentage of neutrophils containing "toxic granules," (5) estimation of the percentage of neutrophils showing severe damage and (6) calculation of the "index of resistance."

The "index of resistance" was calculated from the formula  $(T/10) (P-70)$ , in which 'T' represents the

total white count in thousands and P represents the percentage in neutrophiles. It is apparently of little significance when the white count is less than 10,000.

Of a group of 22 patients with appendicitis (14 of the appendices were gangrenous and 8 presented a mildly acute condition) 100 per cent showed an increase of non filamented cells, 73 per cent an increase of toxic granules and 43 per cent an increase of recognizable degenerated neutrophiles. The percentage of non filamented cells was therefore found to give more accurate information regarding the presence and severity of the process than the percentage of either toxic granules or degenerated cells.

In 10 patients with pneumonia the percentage of non filamented cells gave the most helpful and accurate index and this was confirmed very closely by the percentage of degenerated cells. The percentage of toxic granules was of little help.

In 21 patients with miscellaneous infections the percentage of non filamented cells indicated a condition more frequently in accord with the clinical findings than either of the two other percentages.

For accuracy of information speed and ease of execution it appears that determination of the percentage of non filamented cells constitutes the most valuable qualitative examination in this group of infections.

The determination of degenerated cells requires a degree of training and technical skill that is not to be expected of the average hospital technician.

SAMUEL KAHN, M.D.

Heller A. M. and Medvedeva T. I. The Role of Anaerobic Bacteria in Noma. Clinical and Experimental Observations. *Vestnik khir.* 1939 57 409.

The authors treated 14 cases of noma or gangrenous stomatitis by excision of the necrotic tissues followed by an application of iodine and potassium permanganate solutions. The oral cavity and the defect resulting from the operation were irrigated twice or three times daily with a warm potassium permanganate solution and a high caloric diet was prescribed. In none of the 14 cases did the authors succeed in arresting the progress of the condition and all 14 children succumbed to noma.

In 53 other cases this treatment was supplemented by the administration of an anti perfringens serum. Under the influence of the injections the edema diminished, the pathological infiltration of the tissues disappeared within four or five days and cicatrization followed. In cases with extensive necrosis a cessation of the process was obtained and gradually healthy granulations appeared. Moreover the general condition of the children improved and apathy was replaced by considerable activity and an improved appetite.

In 15 cases blood cultures were made and in 5 of them the bacillus perfringens was isolated; the remaining 11 cultures were sterile.

The authors conclude from their investigations that the presence of perfringens bacilli in noma is not accidental; it aggravates the condition considerably and in many instances is responsible for the spreading of the necrosis and toxemia. The use of a specific anti perfringens serum is logical because clinical and laboratory observations show its efficiency and point to the presence of toxemia in noma.

Fusospirochetosis accompanying noma should be considered as a secondary infection which contributes to the seriousness of the condition.

The proper treatment of noma consists of a combination of surgical procedures, especially an excision of the necrotic tissue, with the employment of anti perfringens serum. JOSEPH K. NARAY, M.D.

Hamlin E. Jr. and Sarris S. P. Acute Gonococcal Tenosynovitis. Report of 7 Cases. *New England J. Med.* 1939 221 225.

Seven cases of acute gonococcal tenosynovitis are reported by the authors. Five of these cases were seen within the last eighteen months and constitute one third of the number of cases of acute tenosynovitis seen during this period. The authors believe that acute gonococcal tenosynovitis is far more common than reports indicate. The cases should not be treated as the ordinary pyogenic infection of the tendon sheath because the end result may be poor.

The subjects of cause and pathology are not described other than that the character of the pus found in the tendon sheath is similar to that seen pouring from the fibrinated end of a fallopian tube acutely infected with gonococci.

Gonococcal tenosynovitis should be suspected in any case in which there is no history of antecedent trauma in which there is a concomitant primary focus of gonorrhea and in which the signs and symptoms appear less severe than their duration would suggest. However these factors should not be relied upon to make the diagnosis. In each case reported the classical signs of acute tenosynovitis were present but in only 1 were they as marked as would have been expected had the infection been from the staphylococcus or streptococcus. Redness, tenderness, swelling and limitation of motion were always observed but in only 1 case were they particularly severe and in some of the cases the infection seemed to be localized in only a part of the tendon sheath rather than to extend so as to involve the entire structure. The general systemic reaction to the infection was only slight.

Once the diagnosis is suspected it may be established only by means of a positive smear or culture of the pus in the tendon sheath. This may be done by aspiration of a specimen of pus from the tendon sheath under aseptic technique. Anesthesia is not required. The puncture is best made through the center of the middle flexion crease at which point the tendon sheath is very superficial. The material obtained should be smeared, stained and examined.

immediately before exploration is done. Cultures should also be made. This method of procedure was used only in the last 3 cases but has proved successful.

If the aspiration does not yield sufficient pus or if for any reason the diagnosis cannot be established, then an exploratory incision should be made under general anesthesia and with a bloodless field. Further smears and cultures are taken from the tendon sheath. If gonococci are found the incision is closed. If gonococcal tenosynovitis is strongly suspected the incision may be closed and the result of the cultures awaited.

For culture of the gonococcus the pus is immediately streaked on ascitic agar plates. The plates are then placed in jars into which carbon dioxide gas is blown, then the jars are sealed and incubated.

The optimal treatment for gonococcal tenosynovitis is immobilization with application of local heat, and not incision and drainage as generally recommended. With the advent of sulfanilamide and the excellent results attributable to this drug in gonococcal infection, it appears all the more evident that if a diagnosis of gonococcal tenosynovitis can be established surgery is not only unwise but contraindicated.

A word of caution is added: conservative treatment should be instituted only if the gonococcal origin has been established. The danger of postponing incision and drainage of acute tenosynovitis caused by common pyogenic organisms is well known. If real doubt exists as to the causative agent then a case of acute tenosynovitis should be handled in the classic manner.

In the 7 cases reported, 3 of which were aspirated and 4 drained the results have all been good. No serious permanent deformity occurred because there was no secondary contamination in the cases operated upon. It is probable, however, that they did well in spite of the treatment rather than because of it.

The reports of the 7 cases are given. There was a question as to the traumatic origin in only 2 cases. In 4 cases a primary focus of gonococcal infection was found.

HARVEY S. ALLEN, M.D.

**Browning, C. H.** The Present Position of Chemotherapy with Drugs of the Sulfanilamide Group. *Brit. M. J.* 1939 2 265.

The author presents a general perspective of the voluminous literature on sulfanilamide and refers to unpublished work in which he has participated. Attention is called to the fact that while cure of certain experimental general bacterial infections by sulfanilamide compounds is an enormous advance, the efficacy of the present drugs is by no means ideal. For example, when mice are concerned sulfanilamide is surpassed by M & B 693, rodimone, and especially by the related monoacetyl p,p'-diamino diphenyl sulphone. With all of these the range of effective dosage is not wide and to be most successful treatment must be begun early. Further work on the

absorption and excretion of members of the series, and on the chemical transformations which they may undergo in the body, as well as clinical observation, is necessary in order that the best drug the amount to be administered, and the spacing in time may be ascertained. When conditions favorable to general infection have arisen, prophylactic use of the sulfanilamide group should be valuable. When infection has been established the best therapeutic effects are secured in acute, diffuse conditions with out marked local tissue changes. Hence these drugs are not likely to obviate operative procedures when focal lesions, such as accumulation of pus or extensive necrosis of bone or other tissues have occurred.

WALTER H. NADLER, M.D.

**Buttle, G. A. H.** Pharmacology of the Sulfanilamide Group of Drugs. *Brit. M. J.* 1939 2 269.

The drugs in general use for chemotherapy of bacterial infections are sulfanilamide and certain of its derivatives, notably M & B 693. These derivatives can be divided into those in which substituents are introduced into the amino group and those in which they are introduced into the amide group.

The action of these drugs is discussed from the aspects of absorption and excretion, and of toxic symptoms. Clinically, blueness of the skin is by far the most common symptom. This is not necessarily accompanied by a change in the condition of the blood pigment and is generally considered to be no contraindication to further administration of the drug. Nausea with epigastric pain with occasional vomiting, may be produced by sulfanilamide; this may disappear after the first day or two. Drug fever, sometimes accompanied by a rash, may occur from seven to twelve days after medication is started. Depression, headache and dizziness are common, especially in ambulant patients. Palpitation, paresthesia, tinnitus, and occasionally multiple neuritis may occur. Agranulocytosis is by far the most severe condition produced, but only 13 cases, of which 9 were fatal, have been ascribed to sulfanilamide, 6 cases have been reported as being due to M & B 693. A blood count every third day is advised in the cases of all patients who receive the drug for more than ten days. Hemolytic anemia is also rare. The most troublesome symptoms following the administration of M & B 693 are nausea and vomiting. Several instances of hematuria have been reported.

WALTER H. NADLER, M.D.

**Zaytzeff, Jern. H. and Meloney, F. L.** The Effect on Bacteriophage of Protinyl, Sulfapyridine and Other Antiseptics and Dyes Used in Surgical Practice. *J. Lab. & Clin. Med.* 1939 24 1017.

Bacteriophage is susceptible to, and is destroyed by certain of the stronger antiseptics. There is a differential susceptibility to some of the weaker antiseptics; the staphylococcus bacteriophages being regularly more susceptible than those of the bacillus coli. The latter in turn are more susceptible than those of the bacillus pyocyaneus. Therefore, anti-

septica in general cannot be used with bacteriophages in the treatment of mixed infections. Zinc peroxide is no exception to this rule.

Prontylin sulfapyridine and prontosil do not interfere with bacteriophage action. It is therefore possible to combine the use of sulfamidate and sulfapyridine with bacteriophage in those mixed infections which are caused by the hemolytic streptococcus combined with the staphylococcus or the bacillus coli. This combined method has been used with gratifying results in a number of cases.

SAMUEL KAHN, M.D.

## ANESTHESIA

Nagel, M. The Advantages and Disadvantages of Pernocton Narcosis in Surgery (Ueber Vorzuege und Nachteile der Pernocton narkose in der Chirurgie). *Deutsche medizinische Wochenschrift* 1938 2 1685.

This work is based upon 1820 anesthetics with pernocton. Preliminary doses of 10 mgm of morphine and 0.3 mgm of scopolamine were given an hour before the anesthesia itself. Pernocton is used only as a basal anesthetic in a maximum dose of 5 c cm. Full effect of the agent is obtained by supplementing it with small amounts of ether (pernocton combination anesthesia). The more slowly and uniformly the drug is injected (2½ c cm per min) the more satisfactory is its action. From twelve to fifteen minutes should be allowed for its administration. The depth and the duration of the sleep are very extended and therefore the supplementary agent either need be given only sparingly. In almost all cases about 50 c cm of ether suffice to give relaxed anesthesia for over an hour. This is due in part to the use of the economical Ombredanne ether mask.

Further advantages of pernocton are

1. Uniform depth of the anesthesia. The possibility of the combination of pernocton with local anesthetic agents is particularly useful in abdominal work.

2. Freedom from danger. This end is readily attained by grading the individual dose. The intravenous administration of coramine is a specific remedy for untoward effects.

3. Fewer postoperative complications. In the cases anesthetized with pernocton no true pneumonias were seen. This result was due in part to the use of the Ombredanne mask and in part to the careful postoperative regimen. Breathing exercises, the early rising of all patients, the use of large mustard plasters for from fifteen to twenty minutes in all cases showing respiratory symptoms and the energetic use of quinine therapy (quinine calcium Sandoz). As a result of these measures postoperative thromboses are seldom observed. Use of the drug in kidney disease and even in eclampsia is not contraindicated.

4. Psychic and postoperative excitement is decreased. Since pernocton can be given directly in the patient's own room with appropriate verbal suggestion an excitement stage is practically eliminated.

In postoperative states unpleasant hangover effects which with inhalation anesthesia often last for several days are completely lacking.

In contrast to pernocton which is given for operations that are known to take relatively long periods of time, evipan (alone) is given for short anesthetics in cases in which complete muscular relaxation is required, as for instance in the reduction of fractures and dislocations. In cases of cesarean section the use of pernocton basal anesthesia supplemented by the Ombredanne mask is contraindicated because of possible aphyxia of the child. The least danger in such cases is afforded by ether administered by the open drop method.

(F. O. MAYER) AUGUST JONAS, JR., M.D.

Rovenstone, E. A. and Cullen, S. C. The Anesthetic Management of Patients with a Hyperactive Carotid Sinus Reflex. *Surgery* 1939 6 167.

The carotid sinus is one of the reflex centers which maintains control over the activity of the vascular and respiratory systems. The carotid sinus reflex may be initiated by either external or internal stimuli and results in circulatory or respiratory adjustments. Initiators of the carotid sinus reflex are (1) chemical changes in the blood itself, (2) variations of pressure in the arterial tree and (3) mechanical pressure or surgical traction of the carotid arteries at their bifurcation. Thus two types of receptors may be described: (1) the chemical receptors and (2) the pressor receptors. Anatomically the chemical receptors are located in the carotid body. They are stimulated by body biochemical changes such as oxygen lack or carbon dioxide excess and exert their main influence upon respiration. They are best called carotid body receptors. The pressor receptors are located in the carotid sinus which is innervated by the carotid sinus branch of the glossopharyngeal nerve. The latter are best called carotid sinus receptors. Their efferent pathway is through the vagus and cervical cardiac sympathetics. The physiological effect would therefore be manifested on the heart and circulation. Thus in the normal individual an increase in the arterial tension or more specifically an increase of pressure in the carotid sinus causes a lowering of the blood pressure and a decrease in the heart rate. The carotid sinus reflex and receptors can be affected by anesthetic drugs. The anesthetic technique, hemorrhage and operative manipulation. Any factors which depress or abolish the normal carotid sinus reflex result in destruction of the normal compensatory mechanism against hypotension (shock). The circulatory collapse caused by severe trauma, hemorrhage, high spinal anesthesia, anoxemia and inhalation narcosis may be associated with paralysis of the carotid sinus reflex.

The carotid sinus syndrome is the clinical signs and symptoms which result from abnormal function of this reflex center. The untoward symptoms consist of (1) psychic changes, (2) fainting spells, (3)

periods of unconsciousness and (4) generalized convulsions. The carotid sinus syndrome may be manifested as one of three types: (1) the vagal type recognized by bradycardia, asystole, arrhythmia, hypotension and cerebral anemia; (2) the depressor type, associated with a vasomotor response of lowered blood pressure, but no changes in the heart rate; and (3) the cerebral type, wherein clinical symptoms exist but there are no signs of vasomotor or heart alterations.

It is essential in the diagnosis of these cases to identify the type of syndrome. By the aid of electrocardiographic tracings the vagal and vasomotor types can be recognized. Pharmacological tests are best for the identification of the type of carotid sinus syndrome. Atropine sulphate (1/150 gr.) will abolish the vagal type. Epinephrine or ephedrine eliminates the depressor type. There is no drug at present which has any effect on the cerebral type.

Carotid sinus sensitivity may be demonstrated clinically by a simple mechanical test. The patient is permitted to sit in the upright position. The sinus is located by drawing a horizontal line across the level of the lower angle of the mandible. This line where it meets the lateral border of the sternomastoid muscle indicates the level of the bifurcation of the carotid artery. Pressure over this area for from twenty to thirty seconds in a hyperactive carotid sinus will elicit the clinical signs of bradycardia, hypotension and syncope.

The carotid sinus may be blocked with procaine. At the level of the fourth cervical vertebra over the transverse process a skin wheal is raised. A 50 hy 7 mm gauge needle is advanced to touch the transverse process. The needle is withdrawn slightly and directed anteriorly for about 1 cm. Ten c.c. of a 1 per cent procaine solution are then deposited in this area. Care must be exercised not to puncture the large vessels of this area. A successful block is often associated with hoarseness and cough due to anesthetization of the recurrent laryngeal nerve which is anatomically close to the carotid sinus. Pressure over a hypersensitive sinus blocked by procaine will no longer elicit the clinical signs mentioned above. In such a case the diagnosis is definitely established and a periarterial sympathectomy is indicated.

The effect of drugs on the carotid sinus especially in pre-anesthetic medication is of importance. The barbiturates diminish the vagal and depressor types. Evipal, picroton, and pentothal completely inhibit the latter two types. Luminal and barbital do not affect the carotid sinus reflex. Digitalis increases excitability and may induce cardiac arrest and arrhythmia in the presence of an excitable carotid sinus. Atropine and scopolamine inhibit the vagal type of sensitivity.

Nitrous oxide, ethylene and cyclopropane have no effect on the reflex. Ether, vinylene and chloroform depress the sinus with deep narcosis and stimulate it with light anesthesia. Avertin makes the sinus more sensitive. Cocaine and its allied

drugs abolish the reflex when they are applied locally over the sinus.

The authors describe the management of a case in which operation was done for carotid sinus hypersensitivity by periarterial sympathectomy of the carotid arteries at the bifurcation. Morphine, less than the usual pre-anesthetic amount, was given subcutaneously about two hours before operation. The anesthetic agent used was cyclopropane since it does not affect the sinus reflex and allows for the use of high concentrations of oxygen. Endotracheal intubation was done to permit a patent airway and rapid control of the narcosis. The carbon dioxide absorption technique was used as the anesthesiologist can then control the oxygen and carbon dioxide tensions.

The anesthesiologist carefully watched the pulse and blood pressure. It is he who recognizes completion of the denervation by the rise in blood pressure, increase in heart rate, and rise in arterial tension.

Carotid sinus hyperreflexivity may occur during the course of an operation. The anesthesiologist may recognize the onset of such a condition by a bradycardia, a fall in the arterial tension, and a diminution in the pulse pressure. The patient exhibits signs of syncope, a cold wet skin and pallor. When this is recognized the operation should be temporarily discontinued. The anesthetic agent should be discontinued and oxygen given. If the operation is in the cervical region all retractors and packs or other instruments should be removed. A procedure of specific value is to inject from 3 to 5 c.c. of 2 per cent procaine in the carotid bifurcation. Intravenous medication and stimulating drugs are of no value. The authors believe that many of the sudden deaths described in the surgical literature especially after simple incision and drainage of cervical abscesses may be explained on the basis of circulatory collapse associated with carotid sinus hypersensitivity.

BENJAMIN G. P. SHAFIROFF, M.D.

Woodbridge P. D., Horton J. W. and Cornell K.  
The Prevention of Ignition of Anesthetic Gases  
*J. Am. Med. Assn.* 1939 123 740

Experiments were conducted under conditions which duplicated as nearly as possible those existing at the time of a recent fatal anesthetic explosion in a Boston hospital. The investigation led to the following conclusions:

1. Adequate protection against electrostatic sparks is not necessarily obtained by a relative humidity as high as 60 per cent.

2. Cushions on the anesthetist's stool constitute such a serious hazard that they should not be permitted.

3. Inter-coupling near the gases, as by wire wound around the breathing tubes and metal contact to the patient's cheek, is believed to present the following serious hazard:

If when the mask is being removed, the interruption of the connection between the chain and the face should occur simultaneously with some event

teoding to produce a charge on the patient or on the machine there might well be a spark discharge between the face and the chain. This spark would of necessity occur directly in the spill of explosive gas from the machine. There is a further hazard due to the possibility of a break in the wire where it is embedded in the rubber. This break may occur in such a way as to introduce a spark directly into the explosive mixture. If metallic electrical connection is to be maintained between the patient and the gas machine the conductor should be placed at a distance from the breathing tubes and mask. It must be so arranged that it need never be disconnected while explosive gases are present because disconnection of an effective conductor will produce a gap across which a spark could jump.

4. Previous reports as to the hazard involved by wool and silk were confirmed. Woolen blankets and silk and woolen outer garments should never be allowed near explosive gases. Undergarments of either silk or wool do not constitute an electrical hazard. To produce a charge from such fabric it is necessary first to rub it with some other material and then to separate the two. If the two are not separated there can be no electrical potential.

5. It was immediately obvious that the ideal method for complete removal of the possibility of an electrostatic potential between any two objects in an operating room and thereby for prevention of any spark discharge which might ignite an explosive mixture would be to interconnect all objects and persons by conductors between the bodies or from these bodies to a conducting floor which would then serve as a common interconnector. This method is believed to be impracticable with any means that have as yet been made available. However it is

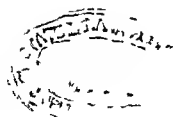
possible by intercoupling to reduce certain specific hazards of frequent occurrence. A method is proposed based on the assumption that under normal conditions of administration of anesthetic gases no mixture of explosive concentration is likely to exist in an operating room outside of a region of about a foot in radius surrounding any gas leak. The patient, the gas machine and the anesthetist should be so intercoupled electrically that sparks cannot occur between them. The major portion of all electrostatic potentials having dangerous possibilities is thus eliminated. The operating table may be included in this group with advantage.

The intercoupling connectors should be of high resistance in order to prevent shock to the patient from accidental contact with the lighting circuit. Also when connectors of high resistance are used for intercoupling electrostatic sparks between connected objects will be adequately prevented. If the floor of the operating room is electrically conductive it should be included in the intercoupled group.

A unit to maintain the desired interconnection has been made available and may be obtained from the Technequipment Company, Brookline, Mass.

The authors sound the warning that the use of this high resistance intercoupling in no way eliminates the need for other precautions against static spark. These precautions include the maintenance of high relative humidity in the operating room, the wetting of rubber parts before use, the avoidance of the use of cloth covers on anesthesia machines and care that the breathing bag is not removed during anesthesia to dump its contents. Electrical apparatus used in the operating room must be maintained in good repair to prevent defects.

SAMUEL H. KLEIN, M.D.





# PHYSICO-CHEMICAL METHODS IN SURGERY

## ROENTGENOLOGY

Robb G P, and Steinberg I Visualization of the Chambers of the Heart the Pulmonary Circulation, and the Great Blood Vessels in Heart Disease *Am J Roentgenol* 1939 42 14

The method of visualization of the heart described by the authors consists of 2 essential procedures (1) the rapid intravenous injection of enough radiopaque solution into the blood stream to make the interior of the heart opaque to the roentgen ray during the first circulation and (2) the making of roentgenograms of the cardiovascular structures at the moment of their opacification. The interval between the injection and the arrival of the radiopaque solution in the various parts of the cardiovascular system is remarkably short and it should be gauged beforehand by measuring the "arm to lung" and the "arm to carotid sinus" time of circulation to the right and left sides of the heart. The position of the patient during visualization must vary with the structures to be outlined, the optimal degree of rotation is determined by roentgenoscopy in each case. With 1 injection, and the 2 roentgenograms provided by the ordinary stereoscopic cassette shifter it is possible to visualize the right side of the heart and the pulmonary arterial tree practically every time the left cardiac chambers and the thoracic aorta can be visualized in about three quarters of the cases.

The experience of the authors now consists of 263 injections in 140 patients. The immediate reaction to the injection is mild and transient even in patients who are seriously ill. Delayed effects are unimportant. There has been no fatality or other serious consequence. The authors outline in detail with case reports their findings in rheumatic and hypertensive heart disease and syphilitic and arterio-sclerotic cardiovascular disease.

The prominence of the pulmonary arc in the frontal view in patients with rheumatic mitral stenosis and insufficiency, was caused directly by the dilated pulmonary artery and not by the enlarged pulmonary conus or the left atrium, the left auricle formed the convexity immediately below the pulmonary arc. Elevation of the left bronchus was not caused by the left atrium but apparently by engorged pulmonary veins. In syphilitic aortitis the intracardiac portion of the aorta (the most frequent site of involvement and one previously invisible) was outlined and the exact size, shape and location of aneurysms of the aorta were determined. The degree of left ventricular hypertrophy and dilatation, the tortuosity and unfolding of the thoracic aorta, the "buckling" of the innominate artery, and the identity of the vessel forming the anterior boundary of the "aortic triangle" were demonstrated in hypertensive heart disease. In the patient with arterio-

sclerotic cardiovascular disease, the heart was found to be normal in size, the apparent enlargement in the conventional roentgenogram being due to the deviated spine. The aorta exhibited a moderate degree of dilatation, elongation and unfolding, with calcification and thickening of the wall.

From these preliminary observations it seems apparent that inference regarding the condition of the heart which is based upon grossly indirect evidence such as the alteration of the cardiac silhouette and the disturbance of adjacent structures, can now be largely replaced by exact information obtained by separate visualization of the 4 chambers of the heart and the great blood vessels. As a consequence the interpretation of conventional roentgenoscopy and roentgenography will become more accurate and enhance the value of these widely used clinical methods of examination, and ultimately will make visualization of the chambers of the heart and the thoracic blood vessels necessary only in cases presenting unusually difficult diagnostic problems.

HAROLD C OCHSNER M D

Polgár F The Cut Off of the Diaphragm Line A New Diagnostic Symptom in Chest Radiography *Acta radiol* 1939 20 219

The differential diagnosis between small fluid accumulations in the costophrenic angle and infiltrations in the lungs in this area is often very difficult. In attempting to make such a diagnosis the author observed that densities within the lung ended abruptly along the edge of the lobe and could be demonstrated by examinations made at proper angles. In the right phrenicocostal sinus the marginal contour was cut off by intrinsic densities at its point of intersection with the great interlobar fissure, i.e. where the middle and lower lobes meet. He calls this sign the "cut off" symptom and believes it makes reliable differential diagnosis possible in the majority of cases. If the shadow in the sinus is caused by an accumulation of fluid the basal medial border of the shadow appears quite different. In case of a typical cut off, the border between free and shadowed parts of the diaphragm is sharp and coincides with the incisura interlobaris. The point of cut off is located anteriorly, behind the anterior chest wall. In contrast to this, small exudates are, as a rule, found in dorsal regions and have a quite different roentgenographic appearance.

ADOLPH HARTUNG M D

Krogdahl T The Roentgen Diagnosis of the Perisigmoidic Infiltration (Ueber die Roentgendignose des perisigmoiditischen Infiltrats) *Acta radiol* 1939, 20 247

While ileocecal tuberculosis and appendicitis in filtration principally may present difficulty in the roentgenological differential diagnosis of perisig-

moist infiltration in the proximal portion of the colon non specific tumor forming peridiverticulitis plays the most important part in the distal portion. Not only does the sigmoid colon and the adjacent portion of the descending colon represent the site of predilection for both diseases but these diseases are typical of senescence and are rarely associated with definite differential diagnostic signs. As compared with peridiverticulitis other inflammatory and more or less markedly tumor forming and strictureing processes play a subordinate part in this respect, partly because they occur extremely rarely in this portion of the intestine (tuberculosis actinomycosis typhoid lues anthrax bilharzia) and partly because the history and the nature of the disease more often indicate the disease. The same factors would apply to the secondary transition of inflammatory processes from other organs (seminal vesicles omentum and female pelvic organs) to the intestines.

In this article only those forms of peridiverticulitis that are likely to be confused roentgenologically with cancer are discussed. The most important element in the diagnosis is roentgenography after a barium enema. The differential diagnosis of cancer offers the greatest difficulty. Both diseases present (not rarely with a palpable tumor) a more or less pronounced often circular defect in the contrast shadow in which the lumen is changed into a rigid tube with uneven walls and loss of peristalsis. The form and borders of the defect and the structure of the mucosal relief render a differential diagnosis possible in most cases. The diagnosis of perisigmoiditis is primarily a diagnosis of the exclusion of carcinoma. The latter shows such roentgenologically distinct and marked signs that they may be considered almost as pathognomonic while it is much more difficult to elicit positive roentgenological symptoms characteristic of peridiverticulitis or perisigmoiditis infiltration. The evidence of diverticula is significant but this is not always roentgenologically demonstrable and is not pathognomonic although it is a condition *sine qua*

*non* of the disease. Hence the question of what the roentgenologically typical signs of cancer are comes up.

The author presents the following roentgenological scheme in the differentiation between cancer and perisigmoiditis infiltration.

The findings which denote cancer are (1) a short stenosed portion (2) sharply defined borders of the defect running transversely with the lumen of the gut (3) a portio forming protrusion of the defect distally (4) a malignant relief with a gradual transition into normal relief at the edge of the tumor distally and proximally or in a typically sigmoid relief proximally and absence of signs of diverticula and (5) an unsymmetrical and partly indistinct longitudinal contour of the stenosed portion. The signs in favor of an inflammatory infiltration are (1) a long stenosed portion the longer this is the less likely is a neoplasm the cause (2) a funnel shaped stenotic entrance and outlet with gradual transition into more normal portions of the gut (3) a mucosal relief characterized mostly by broad predominantly transversely running folds without sharp transition distally and proximally continuing in a similarly changed relief (4) evidence of diverticula especially within the stenosed portion and (5) a longitudinal contour of the stenosed portion which is unsymmetrically and quite deeply jagged with partly pointed prominences and depressions.

In spite of this evidence and most careful examination there are cases in which a definite differential diagnosis is impossible especially when a cancer has perforated the gut. However repeated examinations may make a diagnosis possible. A careful roentgenological examination may also help therapeutically and in the differential diagnosis when there is a suspicion that the observed inflammatory infiltration is peritumoral. Such antiseptic roentgenotherapy may decrease the size of the tumor within a short time and render it more mobile and more sharply defined for subsequent operation.

LOUIS NEUWELT M.D.

## MISCELLANEOUS

### CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Fischer, A W. The Relations Between Accident and Disease from the Standpoint of the Surgeon (Ueber den Zusammenhang zwischen Unfall und Krankheit vom Standpunkt des Chirurgen) *Öff. Ges. dienst* 1939 4 943

Only in the last decade a revision of the theories governing the development of diseases as a sequence of trauma has been undertaken. This is the result of more critical examination of the statements given in casualty cases with reference to the injuries. The old teaching of *Locus minoris resistentiae* must be considered, at best, with extreme caution. Local allergic reactions in highly sensitized individuals may offer clinical manifestations that easily could be interpreted in favor of this teaching. In diseases developing most frequently from endogenous and not from exogenous causes the strictest means of establishing the clinical sequel between a proved accident and the disease must be used also, the location of the trauma and that of the diseased part of the body must correspond and finally the interval between the date of the accident and the occurrence of the disease must be definitely known before liability can be allowed.

Without any dogmatic obstinacy, this principle also obtains in surgical tuberculosis and in osteomyelitis. In regard to the former the author never could recognize any relation to trauma. In regard to abdominal hernias a quite clear conception has forced itself to the fore which may account for strangulations following accidents. The anatomical findings of the hernia however, with few definitely established exceptions could not be classified in most of the cases as being of traumatic origin. A true accident hernia was never seen by the author. Abdominal scar hernias following laparotomies necessitated by accidents are liability cases. The author believes it is very improbable that gastric ulcers and their perforations are related to accidents. Gastric hemorrhage due to severe accidental abdominal pressure or to markedly increasing the blood pressure is more readily conceivable as a liability case. The author does not believe an appendicitis traumatica exists. Rupturing of the vermiform appendix is not appendicitis. An appendiceal abscess may be ruptured by trauma. There is no basis for classifying ileus and volvulus as being due to accidents. It is tenable that an invagination is of traumatic origin only when a violent trauma causes circumscribed cramps in the intestinal musculature and forces the contracted section to slip into the larger peripheral part of the bowel. In traumas of the spleen the occurrence of a bilateral rupture is always suspected. Cancer of the gastro-intestinal canal has no relation to accidents. The acknowledgment of complaints

induced by adhesions caused by abdominal traumas or those following abdominal operations necessitated by traumas, is to be very cautiously considered. The proof that these adhesions really cause disabling conditions must be subject to roentgenological corroboration. In bone and joint diseases it is always a question whether the accused accident really plays an essential part in the entire diseased condition. The so called "overlifting" in older laborers is usually not caused by an accident; the pain is solely the first clinical symptom of senescent changes which are demonstrable.

(HEINEMANN GRUEDEK) MATIAS J SEIFERT MD

Moore V H. Early Recognition of Shock and Its Differentiation from Hemorrhage. *Ann Surg* 1939 110 260

The author has reviewed all records of hemoconcentration or acute erythrocytosis that could be found in the medical literature only a few of which have been cited in this paper. The evidence summarized from these reports indicates that hemoconcentration is related etiologically to the mechanism by which the syndrome of shock develops in various clinical conditions. Most of the authors attributed hemoconcentration to the leakage of plasma through endothelium which had been rendered abnormally permeable by some injurious agent or condition.

His experimental studies have included the intra-peritoneal introduction of muscle, liver and other tissue substances, injections of watery extracts of normal tissues of bile and its salts, peptone bacterial cultures and toxins, bismamine snake venoms and drugs such as emetine, veronal and other barbiturates. His studies also included burns, trauma, intestinal manipulation and obstructions and the effects of proteins in sensitized animals.

Regularly and without exception the agents and conditions mentioned produced hemoconcentration. This appeared early and its degree was proportional to the apparent illness of the animal. When recovery followed the blood returned to its normal composition. When death resulted the post mortem findings were those which are characteristic of shock.

It appears that any agent or condition which affects capillary endothelium adversely will produce the syndrome of shock if that effect is produced systemically or in extensive visceral areas. Both the experimental and clinical observations indicate that hemoconcentration is the surest and earliest clinical sign of endothelial damage of sufficient extent or degree to cause impairment of the efficiency of the circulation.

Arterial blood pressure is not an accurate criterion of the presence of shock. The latter may be present while the blood pressure is well maintained or even while at its highest recorded point.

Hemoconcentration is progressive it is an index of the degree of shock and it subsides to normal as shock is abated. Also it furnishes a means for distinguishing between shock and hemorrhage. In the latter condition the blood is diluted to a degree proportional to the effects of the hemorrhage.

The presence of hemoconcentration is the earliest clinical sign of shock. It is easily detected is regularly present before other signs appear and results from the same mechanism which causes shock. Its use as a clinical test facilitates the early recognition and treatment of shock. SAMUEL H. KLEIN, M.D.

Besredka A. An Experimental Study of Anti-Tumoral Immunity (Étude expérimentale sur l'immunité antitumorale). *Presse méd. Par* 1939 47 1725

Besredka reports experiments on rabbits with Brown Pearce epithelioma. The animals were inoculated with emulsions of the tumor. It was found that if the tumor emulsion was injected into the testicle it produced as a rule a malignant tumor that metastasized. If the tumor emulsion was injected intracutaneously it produced a tumor of a benign nature even though it was histologically an epithelioma the tumor was eventually absorbed without any ill effect on the general condition of the animal. After the absorption of the intracutaneous tumor the animal developed an immunity so that inoculation of the tumor emulsion into the testicle, the eye, the stomach, the skin, or any other site did not produce a tumor, however in non-vaccinated animals such injections resulted in the growth of a malignant tumor except when made in the skin. The vaccinated animals remained in good health.

While animals vaccinated by an intracutaneous injection of the tumor emulsion maintained their immunity against inoculation with the tumor emulsion even at sites where the most malignant tumors developed in unvaccinated animals this immunity could not be transferred to other animals by the injection of the serum or emulsions of the spleen or brain of the immunized animals.

The immunity produced to the Brown Pearce tumor therefore is of the type of localized or tissue immunity which does not depend upon the production of antibodies in the serum. In this respect it is analogous to the immunity to anthrax.

ALICE M. MYERS

Hopkins Sir F. G. The Importance of Laboratory Effort in Cancer Research. *Brit. M. J.* 1939 2 1

At the official opening of the New Laboratories of the Imperial Cancer Research Fund in London a general survey of cancer research was presented. The results of the experimental approach were stressed and milestones such as the discovery of the transplantability of animal tumors to other members of the same species and the isolation of carcinogenic hydrocarbons were mentioned. The pessimism inherent in the statement that cancer cannot be understood until the riddle of life itself is solved,

which suggests that it never will be understood or at least not for a very long time was denied. The emphasis was on an optimistic point of view as regards future research and a closer collaboration between workers in chemistry, physics and biology. JOHN L. FOOT, M.D.

Boothby W. M., Mayo C. W. and Lovelace W. R. One Hundred Per Cent Oxygen Indications for Its Use and Methods of Its Administration. *J. Am. M. Ass.* 1939 113 477

According to the authors by administration or inhalation of oxygen in any certain percentage is meant the average amount of oxygen in the total inspired air. The amount of oxygen after correcting for water vapor in the alveolar air is between 5 and 6 per cent lower than whatever may be the percentage of oxygen in the inspired air. They discuss the rationale of administration of 100 per cent oxygen.

In traumatic surgery either military or civil, not only is shock of frequent occurrence but often it is accompanied by direct injury to the blood vessels. This produces local slowing of the circulation in addition to the general slowing which accompanies shock. In such conditions the administration of 100 per cent oxygen not only combats the shock but aids in preserving the injured extremity.

In civil as well as military surgery use of oxygen unfortunately has been looked on as a therapeutic measure to be used as a last resort. It is now the custom of one of the authors, Mayo, to administer 100 per cent oxygen immediately after operation to all patients who have undergone an extensive surgical procedure. This routine procedure in conjunction with transfusion of blood in the most severe cases unquestionably has been beneficial to these patients. Although it is impossible to say in what percentage of cases such measures have been life saving there is no doubt that convalescence of the patients so treated has been much more comfortable and satisfactory from the patients' standpoint than otherwise it would have been. This is a surgical objective which should not be neglected.

From a surgical standpoint therefore use of 100 per cent oxygen should not be considered to be only an additional measure for treatment of the patient after collapse or shock has developed, but rather it should be thought of and used as a measure that prevents trouble both for the patient and the surgeon.

The authors have found that administration of 100 per cent oxygen, in combination with use of the Wangenstein or Miller Abbott suction method of intestinal decompression is more efficient than either method alone. The apparatus for inhalation of oxygen described is particularly convenient for these combined types of therapy for the mask is provided with a special hole placed in such relation to the nares that the suction tube can be passed. However in cases of intestinal obstruction surgical measures should not be delayed too long it is easy to be lulled

into a false sense of security by the improvement in the patient's condition including the decrease in the distention which follows the use of 100 per cent oxygen and suction.

When at the operating table the debatable question arises as to whether a partially obstructed or strangulated segment of bowel should be resected the decision can be aided by the anesthetist administering for a few minutes 100 per cent oxygen. If the color of the bowel definitely improves the segment probably will survive, provided administration of 100 per cent oxygen is started immediately after operation. On the other hand, if the color of the bowel does not improve the segment should be removed.

The distressing gaseous distention which so frequently occurs following even some simple surgical procedure often can be relieved or at least diminished, by the administration of 100 per cent oxygen. Many patients experience great relief from gas pains which all too frequently convert an otherwise normal convalescence into a period of agony.

Some types of severe headache, as yet indefinitely determined, with or without nausea and vomiting can be relieved by the administration of 100 per cent oxygen. The administration of oxygen should be started in a routine manner as soon as the cephalogram has been obtained. As a result some patients have no headache and very little discomfort others may have a moderate or severe headache from one to four hours and thereafter only mild discomfort. In nearly all cases there is no further distress after twenty-four hours. The authors have had good results in the treatment of the headache which sometimes follows spinal anesthesia. Certain patients with that combination of headache and nausea which commonly is classified as migraine have been greatly benefited especially those who suffered from the type of migraine which is associated with prodromal symptoms if 100 per cent oxygen can be given during the prodromal period the attack of migraine may be aborted. The alcoholic headache and nausea which occur the morning after sometimes can be relieved especially if administration of oxygen is combined with physical exercise or heat. In a few cases the nausea and vomiting of seasickness have been relieved.

The organisms of gas gangrene and of tetanus are known to be anaerobic. Therefore the authors point out in these diseases the prevention of anoxia in the tissues by the inhalation of 100 per cent oxygen which will increase the oxygen pressure in the tissues between 50 and 100 per cent is a direct and specific method of combating these diseases. In addition in cases of gas gangrene the subcutaneous emphysema which results from the presence of hydrogen and nitrogen is rapidly removed thereby pressure on the capillaries is decreased and an increase in the rate of the circulation of the blood is permitted which further elevates the oxygen pressure in the tissues.

The symptoms which accompany acute massive atelectasis are greatly benefited by the administra-

tion of 100 per cent oxygen. This condition is characterized by the sudden onset of severe dyspnea and cyanosis. These manifestations are due to the continued circulation of blood through that part of the lungs from which all or nearly all exchange of air is prevented by the presence of a plug of mucus or of some other obstruction to a bronchial tube.

In acute pulmonary edema the inhalation of 100 per cent oxygen is of very great benefit in some cases as suggested by Barach inhalation under slight positive pressure (5 cm. of water) has an additional favorable effect. Pulmonary embolism is another condition in which the dyspnea, distress, anoxemia and resulting shock in some instances can be dramatically relieved.

Many types of heart disease will respond more favorably to a standard therapeutic procedure if 100 per cent oxygen also is administered. Relief of the pain of angina pectoris sometimes is obtained with striking rapidity.

The apparatus for the inhalation of oxygen which the authors have used was devised by two of them together with Bulbulian and is known as the B. L. B. inhalation apparatus. It consists of three parts: the mask, the connecting regulating device, and the reservoir rebreathing bag.

**The mask.** For use in aviation as well as for the treatment of patients over long periods of time it was essential that the mask be so designed that it would not only be comfortable but also fit perfectly. Two types of interchangeable masks were designed: one the nasal type leaves the mouth free for talking, eating or drinking which is a decided advantage for prolonged use; the other the oronasal type covers both nose and mouth and is for use by individuals who have nasal obstruction or who are mouth breathers.

**The connecting regulating device.** A metal connecting and regulating device connects the mask to the reservoir rebreathing bag. The oxygen inlet tube passes through this metal device turns downward and conducts the oxygen into the lower part of the bag. It is provided with a rotating sleeve which is pierced by three small openings or airports which can be brought into registry with similar openings in the main tube by turning the sleeve. When it is desired to administer 100 per cent oxygen these airports are closed; when it is desired to dilute the oxygen with air, one, two or three of the airports are left open. In addition there is an expiratory valve provided with a spring under light tension which permits escape of expired air over and above the amount which is just sufficient to distend the reservoir rebreathing bag without causing any appreciable resistance to expiration. By adjusting the airports and regulating the flow of oxygen from the oxygen tank, any desired proportion of oxygen and air can be administered.

**The reservoir rebreathing bag.** The reservoir rebreathing bag is of such size that it will contain slightly less than the volume of air contained in one expiration under the conditions in which the appa-

atus is being used. For practical purposes a bag of a capacity of 500 c cm. can be used in nearly all instances.

**Accessory apparatus.** In addition to the apparatus for inhalation of oxygen a reducing valve and flowmeter are necessary parts of the equipment. Any type of reducing valve and flowmeter manufactured by a reliable concern can be used. The flowmeter should be graduated in liters of flow per minute. A float or kinetic type of flowmeter is preferable to one of a pressure type because the latter is more likely than the former to get out of order and give inaccurate readings, especially for the small rates of flow used in conjunction with this inhalation apparatus. Flowmeters should be doubly calibrated so that they can be used to indicate the rate of flow of pure oxygen or of the mixtures of 80 per cent helium and 20 per cent oxygen that are used for the treatment of asthma by having the double calibration. All reducing valves and flowmeters can be used interchangeably for straight oxygen therapy or for helium oxygen therapy. Unfortunately at present the large cylinders are equipped with two types of valves which have different threads. Therefore a small adapter always should be on hand so that the reducing valve can be attached to either type of cylinder valve.

Each type of mask is made in two sizes. Mask 1 is the nasal mask for men or for women with large faces. Mask 2 is the nasal mask for women or for men with small faces. Mask 3 is the oronasal mask for men and Mask 4 is the oronasal mask for women. First the appropriate size and type of mask for an individual is selected by placing different masks on the patient's face. Then the rubber tube that runs from the reducing valve and flowmeter (these are attached to the oxygen tank) is connected to the inlet tube of the connecting regulating device. The oxygen is turned on so that the flow is about 6 or 8 liters per minute according to the depth and rate of respiration. Next the mask is adjusted in place. In most instances it is most comfortably held in place by the rubber retaining straps being placed around the back of the head or neck, just below the ears. In some instances other positions are better. The length of the strap should be carefully adjusted before it is fastened so that tension is sufficient only to hold the mask gently against the face. The metal pieces on the mask which hold the strap in place can be bent slightly to aid in making the mask fit accurately. It need not be strapped on so tightly that it is uncomfortable even when worn constantly for days. A glance at the reservoir rebreathing bag will tell whether the apparatus is properly adjusted to prevent a significant leak, because the bag expands nearly to capacity on expiration and contracts on inspiration.

When it is desirable to administer approximately 100 per cent oxygen in the inspired air, all three of the portholes in the connecting regulating device should be closed by proper rotation of the airport sleeve, the valve on the reducing valve which con-

trols the flow of oxygen should be so adjusted that the flowmeter indicates that from 6 to 8 liters (more if the patient is breathing deeply) are being delivered. After the patient has become accustomed to the apparatus the rate of flow often can be reduced to 5 or 7 liters per minute. However at all times when it is desired to give 100 per cent oxygen in the inspired air the rate of flow should be sufficient that the reservoir rebreathing bag does not completely collapse on inspiration. If when all the air ports are closed the rate of flow of oxygen is not sufficient to prevent the bag from completely collapsing there will develop a sudden marked resistance to completion of the inspiratory cycle which may frighten the patient if it occurs before he is completely accustomed to the apparatus.

When it is desired to administer from 50 to 60 per cent oxygen in the inspired air that is to use the concentration of oxygen that commonly is employed in the best run of oxygen tents, then the rate of flow of oxygen from the tank, as measured by the flowmeter, should be 4 liters per minute for a large adult and slightly less for a small individual. The rotating sleeve on the connecting regulating device of the inhalation apparatus should be so turned that two holes are open. These holes automatically permit the addition of the proper amount of air when the flow of oxygen is 4 liters per minute to cause the inspired air to contain between 50 and 60 per cent oxygen. When oxygen diluted with air is being administered and the two airports are open the reservoir rebreathing bag completely collapses on inspiration and the patient automatically obtains the remaining amount of his inspired air through the open airports.

The authors caution that in adjusting the mask to the face the nurse should be careful not to have the retaining strap too tight. Tension of the strap should be sufficient only to hold the mask in place and it is sufficiently tight if the reservoir rebreathing bag is moving up and down regularly with each respiration. Whenever the nurse passes the patient she should glance at the reservoir rebreathing bag. If it is not moving only a moment is necessary to adjust the mask properly. To keep the patient comfortable the mask should be removed at intervals of about two hours and the patient's face washed, the skin dried and talcum powder applied. If the patient is at home any competent member of the family can be taught in a few minutes just what to do. In fact when the mask is used in the prodromal stage of certain types of migraine to abort an attack the patient can be taught in a brief time the entire technique of administering the oxygen to himself at home.

**Cost of oxygen therapy.** Up to now the high cost of oxygen therapy has acted as a deterrent to its general use early in the course of an illness. To administer oxygen by a tent costs the patient from \$12 to \$25 a day without allowance for the special nursing which is usually a necessity. The authors declare that by use of the B. L. B. inhalation appara-

tus the cost of oxygen therapy should average from only \$5 to \$8 a day while at the same time the oxygen will be given more efficiently and can be given in higher concentration, and in most cases without reduction in comfort.

The oxygen inhalation apparatus described will greatly decrease the cost of oxygen therapy. Its use will increase the availability to the general public of oxygen therapy and of helium oxygen therapy because the apparatus is as suitable for use by the family physician in the patient's home as it is in large well equipped hospitals. Furthermore the scope of oxygen therapy is broadened because the oxygen can be given in any concentration up to pure oxygen which enlarges the field of treatment to include diseases that are benefited by high concentrations of oxygens and which do not respond much if any to lower concentrations. Inhalation of 100 per cent oxygen does not cause pulmonary irritation if administration is not maintained continuously for more than two days after two days lower concentrations should be used.

Guthe T and Nygaard K. Studies on Ascorbic Acid by Means of the Photelgraph. *Acta med Scand* 1939 101 40

In a previous article a new apparatus the photelgraph based on the photo electric principle was described. The apparatus permits automatic recording of varying transillumination values during so called progressive processes. Along with the discussion of the principles of photo electricity the applicability of this apparatus to photochemical processes was pointed out.

In the present article the principal points in photochemical reactions are briefly discussed in general. Particular attention is drawn to the phenomena of velocity and acceleration in the photochemistry of progressive processes in which redox dyes are employed as indicators of oxidation reduction processes.

The production and regulation of chemical change by light with special reference to the reducing effect of ascorbic acid on methylene blue is discussed. Light of wave length from 560 to 680  $\mu$  has a similar activating effect on ascorbic acid *in vitro* as ascorbic acid oxidase has on respiration systems *in vivo*. This range from 560 to 680  $\mu$  coincides with the absorption spectrum of methylene blue.

A new method with the photelgraph for direct estimation of the quantitative yield in photochemical oxidation reduction of ascorbic acid methylene blue is described. By continuous recording of the process on electrocardiographic paper the velocity of the reaction is directly accounted for and controlled by the geometrical appearance of the resulting curve which has been termed scorbelgram. The time factor (velocity) is dependent on a number of other factors the chief of which are the quantity and quality of radiant energy the temperature the concentration of ascorbic acid and the indicator.

Under standardized conditions the photochemical process between ascorbic acid light and methylene blue is quantitative also as regards the time factor. Theoretical and practical points in this connection are supported by suitable data.

In the scorbelgrams the degree of reduction is determined by means of the 'deviation value' which means the photo electric difference between partially and completely reduced specimens expressed in millimeters. The minimum value of illumination effecting 100 per cent reduction (deviation value=0) with a given amount of ascorbic acid within a chosen convenient standard time is termed the illumination titer of that particular concentration of ascorbic acid. A constant inverse relationship between different illumination titers and the respective concentration of ascorbic acid has been observed. This observation and the demonstration of an equimolecular reaction between ascorbic acid and methylene blue express the quantitative basis of the method described which obeys the general laws of photochemistry.

Finally some factors regarding the velocity and specificity of the reaction are discussed among others the influence of pH and of interfering substances. The geometrical appearance of the scorbelgram indicates to a certain extent the relative specificity of the reducing substance.

Some kinetic points regarding the quantitative applicability and photochemistry of oxidation reduction processes have been treated somewhat in detail. This was found necessary in order that a proper basis for quantitative studies in body fluids be obtained these studies are to be published subsequently.

Hanke H. Hormones and Surgery (Hormone und Chirurgie). *Deutsche med Wochenschr* 1939 2 1617 1653

There are many misconceptions concerning the action of hormones. Hormones do not come solely from glandular organs as for example the posterior lobe of the pituitary gland and the adrenal medulla. The essential point is that these substances act far from their source of origin. Wound hormones cannot be accepted as such besides they are as yet hypothetical. Furthermore genuine hormones have not as yet been demonstrated in the blood. The internal secretory system is not a self sufficient and enclosed system. It is intimately associated with the sympathetic nervous apparatus. It is not accurate to state that certain hormones always act synergistically or antagonistically to each other as for example increased function of the thyroid gland acts antagonistically to the pancreatic islands of Langerhans. The total removal of the thyroid gland should therefore be effective in the treatment of diabetes however this is not true in the non hyperthyroid diabetic patient.

With the diminution or exclusion of normal thyroid function we are in an absolutely new surgical field which presents many problems. Organic heart

disease in the hyperthyroid patient may be favorably influenced by thyroid resection. However, Americans have recommended that subtotal or total thyroidectomy be done for severe organic heart disease in the presence of a normal thyroid. Following the latter improvement was observed in 10 per cent of the cases and a very low mortality. The last word has not yet been said concerning the end results. Compensation for deficient thyroid function is now assured by the administration of various standardized thyroid preparations (thyroxin, elthyran). The quantities to be administered vary with the individual needs. Absolute indications are myxedema and ablation of the thyroid gland. There are also certain relative indications for thyroid therapy depending on circumstances. Bretnner treats endemic goiter with small doses of thyroxin for a half year beginning with three weeks of age. Care is necessary to avoid thyroxin induced Basedow's disease. However, the attempts to increase the normal thyroid function are uncertain. The author discusses Rehn's teaching that there is a danger from operative work on the thyroid in that the sympathetic system may be inhibited and also mentions the activating effect of the anterior hypophysis on the thyroid gland. At the Freiburg Clinic in 4 instances before operation 200 units of the thyrotropic anterior pituitary lobe were given from one to two days together with iogon under the control of basal metabolism determinations; the increase in the circulating blood occurred parallel with the increase in the basal metabolism. Apparently this treatment also acts favorably on postoperative pulmonary complications and emboli. The question comes up whether the thyroid hormones also have a favorable influence on regenerative processes in wound healing and callus formation as has been shown with vitamins. Certainly they affect the general metabolism in wound healing, but the answer to this question is difficult because there are so many factors in the process of wound healing. Of practical significance is the effect on bone callus formation. It is known that in the hyperthyroid individual callus formation is not harmed (Caegesser). Hanke's own experiments on animals indicated that the administration of elthyran accelerated healing. Although Vitamin C is indispensable preparations from the thyroid and the anterior lobe of the pituitary gland act only as supplementary aids.

The relation of the adrenal glands to generalized fibrous osteodystrophia must still be elucidated since tumors of the gland are not always associated with hypercalcemia. The author's own observations indicate that the adrenal changes are secondary rather than primary. Frequently the surgeon finds in such cases atypical changes in the thyroid or thymus glands. Furthermore there is no real knowledge as yet concerning the relation to localized osteodystrophia. Paget's disease, myositis, scleroderma and chronic polyarthritis. Surgery has made many errors. More accurate is our knowledge in the treatment of the tetanes. In acute tetanic

spasms parathormone works immediately while Acto (Holtz) is better for prolonged action. The latter is given by mouth in small doses and under control with serum calcium determinations. With this treatment the implantation of parathyroid bodies is rendered unnecessary.

The hormone of the thymus apparently plays a role in severe pseudoparalytic myasthenia in which condition tumors have been found (Adler). Also it seems to be related to the thyroid gland in certain fatal cases (Klose and von Halverer). Preoperative radiation is to be considered. One hears little nowadays of the formerly very common status thymolymphaticus.

With regard to the pancreas the author mentions hyperinsulinism that is a spontaneous hypoglycemia with manifestations of insulin shock due to adenoma of the islets of Langerhans and cured by their surgical removal.

Former correlations with epilepsy have proved erroneous. Adrenal cortical tumors which cause premature sexuality and adrenal medullary tumors which cause paroxysmal hypertension are amenable to surgery. Nevertheless surgery in ordinary hypertension is to be avoided unless there is a demonstrable hyperadrenalemia. This also holds true for juvenile gangrene and Raynaud's disease except when increased adrenal secretion is observed. Experience with Addison's disease has proved unfavorable. The favorable results from adrenalin administration in circulatory collapse are noted. We have still very little experience with adrenal cortical hormone which may act favorably in burns, infections and toxemias because pathologico-anatomical changes are found in the organs.

Although we are well informed as to the physiology of the pituitary gland from a practical therapeutic standpoint we are not very successful in our treatment of acromegaly, Simmonds' disease and basophilic changes of the pituitary gland. The surgeon however will treat the tumors. The anterior pituitary lobe preparations preloban and prephyson are very uncertain. Attention is called to Sauerbruch's transplantation of the pituitary gland in Simmonds' disease. Furthermore the effectiveness of the posterior pituitary lobe is pointed out in postoperative intestinal atony, cholelithiasis, renal stones and failure of the peripheral circulation (Tonaphin).

In cryptorchidism correction may be obtained after the age of six years by the use of testicular hormone combined with prolactin. If this fails surgery is indicated. The action in early prostatic hypertrophy is doubtful. For aid in the diagnosis of teratoma and chorion epithelioma the excretion of gonadotropic hormones in the urine may be utilized. In recent times it has been attempted to demonstrate the influence of ovarian hormones on mammary cancer and chronic cystic mastitis. According to Sauerbruch and Knappe there is a correlation between gonadal endocrine secretions and the growth of malignant tumors.



In conclusion the author discusses padutin (Frey) which is considered to be a hormone, and its vaso dilator action in Reynaud's disease, and other vaso spastic conditions (FRANZ) JACOB E. KLEIN M.D.

### DUCTLESS GLANDS

Marañon G. The Pathogenesis of Cushing's Syndrome (Sur la pathogénie du syndrome de Cushing) *Ann d'endocrinol* 1939 1: 247

Marañon reports 2 cases which showed the typical Cushing syndrome clinically but autopsy showed the anterior portion of the pituitary gland to be entirely normal and the adrenals hyperplastic. The first of these cases was reported by the author in 1926, before Cushing had described the syndrome that bears his name; the second case was seen more recently and has not been fully reported previously. In the first case the author states that he made a definite error in diagnosis which a later review of the case and the pathological findings enabled him to correct. Because of a slight head injury a diagnosis of the adiposogenital syndrome due to pituitary hemorrhage following trauma was made during the patient's life; the finding of a hemorrhage of the pituitary gland involving the median and posterior lobe was considered as a confirmation of this diagnosis. Following the publication of Cushing's article a study of the history of the case showed that the adiposity was of the Cushing type involving the upper part of the trunk rather than the lower part and that there was marked plethora and cyanosis, also characteristic of Cushing's syndrome but not of the adiposogenital syndrome. As the pituitary gland had been preserved in this case a special study of the anterior lobe and the basophile cells was made and they were found to be entirely normal. The pathological report showed that both adrenals were enlarged and showed adenomatous hyperplasia involving both the medulla and the cortex.

In the second case the adiposity was of the Cushing type and involved the upper half of the trunk; it was associated with plethora, cyanosis, bluish stain on the abdomen, an increased red cell count and somnolence. At autopsy a careful study of the pituitary gland showed it to be normal; there was no basophile adenoma and not even the slightest hyperplasia of the basophile cells. Both adrenal glands were enlarged and showed a marked hyperplasia involving the cortex chiefly.

Some cases of Cushing's syndrome have been reported in which no mention of the condition of the adrenals was made or it was stated that they were normal but no histological examination was made. In 1 of the cases the author notes it was stated that the adrenals weighed 20 gm. each which certainly indicates a hyperplasia of some type. On the other hand a number of cases of typical Cushing's syndrome have been reported by others in which there was adrenal hyperplasia without any changes in the basophile cells of the pituitary gland

and other evidences of adrenal hyperfunction have been found in such cases. In 3 cases of typical Cushing's syndrome observed by the author including the second case reported, there was a definite increase of sodium and a normal or reduced content of potassium in the blood—a metabolic formula characteristic of adrenal hyperfunction and the opposite of that observed in adrenal insufficiency. The characteristic symptoms of the syndrome can all be explained as being due to adrenal hyperfunction whether the blood pressure is increased or not depends upon whether the medulla is involved in the adrenal hyperplasia.

It may be that in some cases of Cushing's syndrome the pituitary basophilism is primary and the adrenal hyperplasia secondary. However even in such cases it is the adrenal hyperplasia and hyperfunction that is responsible for the clinical syndrome. The pituitary basophilism on the other hand, may be secondary to the adrenal changes; signs of the involvement of other ductless glands are evident in some cases of the syndrome and the involvement of the pituitary gland might be of the same secondary type and no more important than the involvement of the other endocrine glands. ALICE M. MEYERS

Magoun H. W., Fisher C. and Ranson S. W. The Neurohypophysis and Water Exchange in the Monkey. *Endocrinology* 1939 25: 161

Fisher, Ingram and Ranson have previously indicated that the elaboration of an antidiuretic hormone by the neurohypophysis is dependent upon the innervation of the gland via the infundibulum by a large tract of nerve fibers with their most important component arising from the supraoptic nuclei of the hypothalamus. In both the cat and monkey hypothalamic lesions so placed as to interrupt the supraoptic hypophyseal tract were followed by retrograde degeneration of the supraoptic nuclei and neurohypophysis together with the loss of secretory activity and development of marked polyuria and polydipsia characteristic of diabetes insipidus.

The authors of this article believe that the failure of many investigators to produce experimental diabetes insipidus by stalk section or attempted extirpation of the neurohypophysis has been in large part due to their failure to make the line of incision high enough; the median eminence being left intact.

Because of the emphasis placed on such apparently minute structure as the median eminence an attempt was made to determine what proportion in terms of volume it forms of the total normal hypophysis. In addition the volumes of the degenerated parts of the neurohypophysis distal to the line of transection and volumes of the portions of the gland proximal to this line were determined in the operated animals. These measurements were then correlated with the presence, absence and degree of polyuria shown by the different animals. A series of monkeys were subjected to subtemporal

section of the infundibular stalk under deep nembutal anesthesia and observed for periods up to twelve weeks after operation. In the different animals marked permanent polyuria, mild permanent polyuria, brief secondary polyuria or normal urine outputs were observed.

A study of serial sections of the hypophysis and overlying hypothalamus prepared in every case showed that the animals with marked polyuria had complete transections of the median eminence or section of its anterior half alone, while the animals with the less severe symptoms or with normal urine outputs had sections of the infundibular stem below the median eminence or through the posterior half of the median eminence. Volumetric determinations showed that in the cases with marked polyuria an average of from only 5 to 10 per cent of the total volume of the normal neurohypophysis remained proximal to the section and connected with the hypothalamus. In the cases with normal urine outputs an average of from 12 to 16 per cent of the total volume of the neurohypophysis remained connected with the hypothalamus proximal to the section. Transection of the median eminence or of the infundibular stem regularly caused marked atrophy of the infundibular process.

With preservation of from one sixth to one eighth of the neurohypophysis, normal urine output was maintained. This demonstrates a wide margin of physiological reserve which is comparable to the reserve possessed by various organs of the body, including the endocrine glands.

The negative results encountered by other investigators following low stalk sections in the monkey are to be explained by the sizable amount of neurohypophysis left proximal to the section which was connected with the hypothalamus and innervated by the supra optic nuclei.

SAMUEL B. SPIRA, M.D.

Aschheim, S., Portes, L. and Mayer, M. Pituitary Gonadotropic Hormone Therapy (l'hormone thérapeutique hypophysaire gonadotrope). *Ann d'endocrinol.* 1939, 1: 164.

Any hyperfunction or hypofunction of the genital tract may be the object of treatment with gonadotropic hormones. The genital syndromes in which such treatment would appear justifiable include those conditions which seem to indicate a deficient gonadotropic pituitary function, such as pituitary cachexia, primary and secondary amenorrhea, those conditions which result from a sudden spontaneous or artificial suppression of the menses (castration or the menopause), conditions manifested by metrorrhagia and finally conditions due to abnormal ovarian formations. The conditions amenable to hormone therapy include only those due to pituitary insufficiency.

In pituitary cachexia treatment with total pituitary preparations rather than with the gonadotropic factor alone seems indicated. Improvement in the general condition and even restoration of the

menstrual cycle might be expected from implantation of pituitary glands from newborn infants or animals or from extracts of the anterior lobe of the hypophysis.

There are also cases in which malnutrition is the responsible factor and in which hyperalimentation or the administration of the needed vitamins would have to be considered rather than hormone therapy.

Treatment of primary amenorrhea bears hope of success only in women who have normal even if hypoplastic sex organs. If it can be demonstrated that the amenorrhea is related to deficient pituitary function and that the woman to be treated possesses a uterus and ovaries, one may be justified in attempting hormone treatment, either with estrogenic or gonadotropic substances.

Estrogenic substances act directly upon the uterus itself. In some cases even enormous doses of estrogenic hormone have no effect. Moreover, we have no proof that the administration of such large doses of hormone over long periods of time may not be harmful. Experimentally such a procedure may lead to angiomatous transformation of the pituitary gland and suppression of the gonadotropic function. By limiting the dose to 25 mgm. per month this danger may be avoided. The initial treatment with estrogenic substances may moreover indicate whether the uterus is capable of reacting functionally. If not, it would be futile to apply gonadotropic therapy. If the estrogenic substances have no effect on the uterus and do not restore menstruation, it is probable that there is little hope of producing an estrogenic effect with the use of gonadotropic hormones.

Unfortunately, the positive results obtained in animal experiments by the successive administration of folliculin stimulating and luteinizing hormones for production of the genital cycle are not paralleled by equal results in human subjects. We have first to determine which hormones are to be used, then the proper dose; moreover, we are uncertain as to whether the treatment may not involve some risk to the patient. The gonadotropic hormones cannot be administered orally because they are practically destroyed by the diastase in the stomach and intestine.

Implantation of fresh calf pituitary substance has successfully been performed in a case of primary amenorrhea by Ehrhard; it can hardly be considered for practical purposes. The urine and even the blood of pregnant women have been used for their gonadotropic effect. Some successes have been reported but also many failures. In some cases gonadotropic and thyroid hormone therapy have been combined as in certain patients suffering from amenorrhea with obesity. Also prolactin has been combined with the estrogenic hormones. In such cases the therapeutic effect cannot be attributed exclusively to the pituitary gland.

As regards dosage, there is little uniformity of opinion. The normal woman eliminates about 750 mouse units of gonadotropic hormone during a

menstrual cycle. As the quantity excreted is believed to be less than that secreted by the pituitary gland, an average of 2 000 mouse units may be administered per month for about three months or 100 units daily for twenty days. Whatever preparation is used, it is most important that the reaction of the organism be very carefully controlled. If after the first injections there can be demonstrated an increase in the size of the uterus and increased elimination of estrogenic substances in the urine, one is justified in continuing the treatment and repeating it for several months, even though the menses have not appeared. If on the other hand a painful hypertrophy of the ovaries occurs with the formation of follicular or lutein cysts, treatment should be discontinued.

Secondary amenorrhea responds more favorably to hormone therapy. Before hormone therapy is attempted, it is necessary to exclude tuberculosis, anemia, malnutrition, and genital lesions as the cause of the secondary amenorrhea. In secondary amenorrhea, in which a pituitary origin can be demonstrated, the procedure should be the same as in primary amenorrhea, namely, estrogenic hormone therapy should be used first and eventually gonadotropic hormone therapy may be tried. The same procedure is applicable to menopausal amenorrhea. It must be kept in mind that the menopause involves not only cessation of the menses but also other factors upon which the gonadotropic hormones have no effect. It would seem preferable to employ the estrogenic hormones in these cases.

In sterility due to deficient ovulation, gonadotropic therapy seems justifiable. Biological tests will be required to demonstrate that the menstrual cycles occur without ovulation. Luteinizing hormone may be administered to produce ovulation. However, the failure of the secretory uterine phase may be attributable to other factors as well, and there may be a question of stimulating the cycle in general rather than luteinization *per se*. As a matter of fact, it is very difficult to obtain this effect in women because there are no pure hormonal products on the market containing follicle stimulating or luteinizing principles exclusively. Prolan loses its luteinizing effect if the organism has received preliminary treatment with a follicle stimulating preparation. The establishment of an artificial cycle in human subjects is therefore as yet impracticable.

The hemostatic effect of gonadotropic substances in hemorrhagic conditions, such as the menorrhagias of fibroma or hemorrhagic metropathy, suggests that these hormones intervene by way of the ovary. The hemostatic effect of certain gonadotropic substances might be due to the production of a corpus luteum having all the properties of the pregnancy corpus luteum, which is capable of producing progesterone. However, that may be the use of gonadotropic hormones in the treatment of uterine hemorrhage is recommended. During the second part of the intermenstrual cycle (for instance, ten days after cessation of the hemorrhage), a dose of 1 000 rat units should

be injected every day over a period of from ten to fifteen days.

The use of gonadotropic hormones in the treatment of inflammatory conditions of the internal genital organs appears to the authors not devoid of danger, because in cases of acute inflammation the hyperemia produced might lead to the formation of ovarian abscesses, and in cases of subacute or chronic types of inflammation physiotherapy is preferable because the degree of hyperemia can be regulated at will.

In disorders of the menopause, hormone therapy might yield good results if the physiological phenomenon could be influenced by inhibition of the pituitary gland by the administration of folliculin in large doses and even lutein hormones, however, in the functional disorders, symptomatic treatment should not be neglected. The latter consists chiefly in the administration of sedatives and antispasmodics.

In some cases of ovarian cyst, there is an excessive elimination and secretion of gonadotropic hormones, which may lead to errors in diagnosis. Extra-uterine pregnancy may be suggested and a futile operation may be done. As to the prospects of successful hormone therapy of cysts of the ovary, it must be kept in mind that neither folliculin nor lutein would have any certain or rapid effect on the size of the ovaries. It is only when the cysts are associated with functional symptoms, such as amenorrhea or menorrhagia, that gonadotropic hormone therapy is indicated. The failure of hormone therapy in genital diseases accompanied by an excessive elimination of hormones may be due to the fact that the cause of the syndrome lies in a lesion of the hypophysis. It is difficult to understand why women with excessive gonadotropic hormones and ovaries capable of reaction should be amenorrheic. The problem is very complex and there are probably unknown factors involved.

The various pathological conditions of pregnancy associated with an excess of gonadotropic hormones are discussed. In normal pregnant women, the gonadotropic hormone in the urine averages 20 000 mouse units. In hydatidiform mole, the number of mouse units of gonadotropic hormone per liter of urine may increase to from 250 000 to 500 000 mouse units or more. The ovaries of women with hydatidiform mole are often hypertrophied and deformed by a polycystic transformation. The same condition is found in women suffering from chorio epithelioma. It is possible that not only prolactin but the pituitary gland takes part in the production of these polycystic formations. Women suffering from hyperemesis of pregnancy or from eclampsia frequently present an excess of gonadotropic hormones in the blood and urine, but so far cases of associated polycystic ovary have not been described. The explanation of these phenomena is still impossible. Caution should however be exercised in the combined administration of prolactin and pituitary hormones.

EDITH SCHACHKE MOORE

Leroux R. Mareson G. Richet C. and Pergola A. Tetany in the Adult and Persistence of the Thymus (Tétanie de l'adulte et persistance du thymus) *Ann d'endocrinol* 1939 1 152

The authors have recently emphasized the importance of folliculin in the etiology of certain tetanic conditions. In the present article they draw attention to the rôle played by the persistent thymus in certain cases of tetany. A case of tetanic convulsions in a woman twenty one years of age is described in detail. She died of meningeal hemorrhage. At autopsy the conditions found were subacute parathyroiditis and persistence of the thymus which presented the size and structure of an infantile thymus.

A large number of cases appearing in the literature indicate a relationship between persistent thymus and tetany. In animals extirpation of the thymus produces profound change in the mineral metabolism. Active thymus extracts have a hypocalcemic effect and may under certain conditions neutralize the hypercalcemic effect of parathyroid extracts. The larvae of certain amphibians fed on thymus extracts occasionally develop tetanic symptoms analogous to those produced by parathyroidectomy. If the thymus is removed some days prior to parathyroidectomy tetany will not develop. Extirpation of the thymus produces so to speak an anti tetanic state with deep apathy and a tendency toward immobility and idiocy. Parhon and Marinenco obtained good results from thymus therapy in a case of hyperparathyroid osteosis. In cases of infantile tetany hypertrophic changes of the thymus have been demonstrated in addition to the hypoparathyroidism. The great majority of cases of tetany occur in infancy i.e. in the thymic age and subside spontaneously as the thymus atrophies. Pende believes that patients who were reported as having succumbed suddenly to hypoparathyroidism were suffering from hypothyroidism associated with hypertrophy of the thymus. The thymus and the inferior parathyroid glands are of the same embryological origin. All these facts indicate that an antagonism exists between parathyroid and thymic function which renders most probable the intervention of a hyperthymic factor in certain types of tetany. Klose and Vogt are likewise of this opinion. The case described would support such a theory.

The possible relation of other endocrine factors to tetany has been less widely discussed. Some years ago there was much talk of an antagonism between or a parallelism of parathyroid and thyroid hormones. No experimental evidence has been offered to support the theory of a thyroid factor in tetany; moreover clinical facts would seem to contraindicate such a relationship. Nor have any definite indications of a relation between the pituitary gland and tetany been demonstrated. Pende believes that an intimate relationship exists between parathyroid and suprarenal function which would explain certain cases of tetany associated with suprarenal insufficiency.

The authors conclude that from an endocrinological viewpoint one can hardly be satisfied that tetany indicates exclusively a parathyroid insufficiency even though the latter plays the determining rôle in hypocalcemic tetany. Pende has described cases of tetany of pluri-glandular origin. This seems also the character of the present case. Just as several endocrine glands are involved in sugar metabolism several glands may be involved in the regulation of calcium metabolism so that one may speak of ovarian tetany, thymic tetany or pluri-glandular tetany. In tetany as in diabetes one may have to consider a central nervous factor. For a long time indeed tetany was considered a disease of the nervous system. Sometimes the tetanic syndrome bears a remarkable resemblance to that of epilepsy and there are no doubt cases of true epilepsy associated with tetany and forms of tetany which cannot be differentiated from epilepsy. Hysteria was long considered as responsible for tetanic symptoms. Curschmann has described forms of transition from hysteria to tetany.

At autopsy of a case of tetany in an adult the findings included congestion and punctiform hemorrhages of the meninges and nerve substance itself. In the present case the lesions were those of congestion and diffuse hemorrhages with a central hemorrhagic focus not described in any other case.

The circulatory lesions may be interpreted as being related to the nervous factor presupposing the existence of tetanic vascular spasms. In some cases there may develop a veritable visceral vasomotor tetany localized here or there and capable of course of involving the cerebral vascular system. In other cases of tetany severe disturbances of the peripheral circulation have been described and there is no reason for the assumption that such lesions could not affect the brain as well with a consequent encephalomeningeal syndrome followed possibly by death (as in the present case).

There remains another factor to be considered namely the alimentary factor. It is well known that a Vitamin D deficiency will cause tetanic symptoms. Epidemics of tetany have occurred in regions where for some reason or other the supply of this vitamin was cut short. In the sunny countries of Southern Europe tetany is rare. Tetany is most frequent toward the end of winter and spring when food is most deficient in Vitamin D. For this reason the treatment of tetany with ergosterin (irradiated) and ultraviolet irradiation has been very successful. The rays transform the ergosterin into Vitamin D.

The diagnosis of visceral tetany depends upon the demonstration of the following factors: (1) the existence of other phenomena of contraction or convulsion of the muscles; (2) the existence of trophic phenomena of the hypoparathyroid type such as changes in the enamel of the teeth in the nails and in the hair and cataract; (3) in the absence of these symptoms of tetany there must be signs of latent tetany such as irritability, non stable character and excessive neuromuscular excitability (signs of

Chvostek and Trousseau) or, in women signs of hyperfolliculism, (4) the appearance of hypocalcemia and hypophosphatemia during the suspected visceral attacks (the absence of these symptoms would not justify refutation of a diagnosis of tetany, however) and (5) the disappearance or subsidence of symptoms following the administration of parathyroid preparations. If at most 3 of these criteria are wanting it would be unwise to attribute a visceral syndrome to tetany.

EDITH SCHANCIE MOORE

Leriche R. and Jung A. The Surgical Treatment of Diabetes by Diversion of the Bile Stream. *Experimental and Clinical Studies (Essai sur le traitement chirurgical du diabete par la dérivation biliaire Documents expérimentaux et cliniques) Ann d'endocrinol, 1939 1: 3*

Previously the authors observed stimulation of the islands of Langerhans in experimental studies on diversion of the biliary stream. These results were so stimulating that the studies have been continued both experimentally and clinically.

Experimental studies were made on 17 dogs in which the common bile duct was sectioned, the lower end ligated and the upper end cannulized. The dogs died or were killed at intervals varying from six days to four months. Detailed histological studies of the pancreas and blood sugar tests were made. The most striking microscopic changes were the constant finding of enlarged and vascularized islands of Langerhans. In some of the animals there was noted also periobular sclerosis of the pancreas with degeneration and necrosis of some of the parenchymal cells of the pancreas. The blood sugar studies indicated marked diminution after the biliary diversion in some instances to half of normal values.

One very interesting clinical experience is described in great detail. This concerned a thirty one year old woman who had diabetes for two years before presenting herself at the clinic. In the past she had had mild gastro intestinal disturbances. On appearance at the clinic she had polydipsia, polyuria, glycosuria and hyperglycemia. On abdominal palpation she displayed a mild hypersensitivity over the pancreatic region, the gall bladder area was not painful. She received 100 units of insulin daily.

Under general anesthesia a cholecystectomy was done. The gall bladder was normal and the bile was clear. Her convalescence was uneventful. About 300 c. cm. of bile were drained daily. The stools retained their normal color. The patient received 80 units of insulin the day after the surgical intervention after that no insulin was given. Ten days after surgical intervention the blood sugar was normal and there was no glycosuria. The patient returned home was kept under observation and remained normal for thirteen months. However upon removal of the biliary drain she had a relapse accompanied by marked hypertension. For the latter condition Leriche performed a left adrenalectomy with section of the splanchnic nerves and



Fig 1. Pancreas of dog seven days after diversion of biliary stream.

removal of the first lumbar ganglion. The hypertension was relieved. The patient received no more insulin and returned home, where she is still under observation with hyperglycemia.

The case may be summarized as follows: a young woman with a severe diabetes which did not respond well to the usual dietetic regime combined with insulin was treated by cholecystectomy of her normal gall bladder. There was a marked improvement in the sugar metabolism with disappearance of the glycosuria and a fall to normal of the blood sugar. After thirteen months when the condition was thought to be permanently controlled the biliary drain was removed with recurrence of the original clinical condition three months after removal of the drain.

The authors do not wish to draw any widespread conclusions from this experience but point out that activation of the endocrine apparatus of the pancreas is possible by diversion of the biliary stream. They point out the following facts:

1. In animals biliary diversion induces histological changes in the pancreas characterized by exag-

gerated activity of the endocrine elements associated with hypofunction of the rest of the gland

2 In such animals the blood sugar is habitually low

3 Induced glycemia in such animals is much lower than in control animals

4 In the clinical case cited during the thirteen months of biliary diversion the glycemia ranged from 1.67 to 1.95 without the need of insulin to maintain the equilibrium whereas before the intervention the glycemia was 3 gm in spite of the administration of from 80 to 100 units of insulin per day. The authors are at present contemplating experimental and clinical studies on a permanent cholecystojejunostomy

JACOB E. KLEIN, M.D.

### EXPERIMENTAL SURGERY

Divella D. Hemostasis of Parenchymatous Organs. Experimental Research. (Emostasi degli organi parenchimatosi. Ricerche sperimentali). *Riv di chir* 1930 5 251

Hemostasis of the parenchymatous organs has always been a serious problem for the surgeon and various mechanical physical chemical and biological methods have been proposed. A review of the literature permits the statement that generally speaking the problem has been solved but the various investigators are at variance concerning the tolerance exhibited by the treated organs toward the materials used for hemostasis and consequently the subject is still in the experimental stage. The good results obtained by the use of catgut soaked in human milk which contains a considerable amount of cephaline that is active in causing blood coagulation induced Divella to experiment with egg yolk which is richer in cephaline than human milk.

Hens eggs were boiled to obtain solidification and sterilization of the material to be used and the yolk was reduced to a fine paste. Dogs were employed for the experiments and their hepatic and renal functions were tested two days before and forty hours after the intervention and then at various intervals until they were sacrificed. The spleen was exteriorized and a deep incision was made in it transversally or longitudinally so that the organ could be opened like a book. The wound was immediately covered with a layer of yolk paste and slight pressure was exercised with two fingers to make the layer adhere when complete hemostasis had taken place the organ was put back in its normal site. Then a lobe of the liver was exteriorized and either a deep incision to within a few millimeters of its lower aspect was made a wedge like portion was excised or part of the upper aspect of the lobe was sliced off the wounds were treated like those of the spleen. In the case of the kidney the organ was incised in its entire length down to the pelvis a wedge of yolk paste was introduced into the wound and a strip of paste was applied externally to the line of incision. The animals were killed at interval varying from forty hours to forty three days after the intervention.

The hepatic function was regularly altered about forty eight hours after the operation but returned to normal within a few days. The renal function was not disturbed except for a short time after the intervention. In all cases hemostasis was prompt and permanent the hemorrhage lasting from ten to fifty five seconds and depending upon the individual case. The yolk paste was absorbed in from twenty to twenty five days caused no signs of intoxication and was replaced by a connective tissue rich in fibroblasts.

RICHARD KEMEL, M.D.

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